1020 Bicycle Facilities

1020.01 General

The Washington State Department of Transportation (WSDOT) encourages multimodal use of its transportation facilities. Bicycle facilities or improvements for bicycle transportation are included in the project development and highway programming processes where bicycle use is likely and can be accommodated safely.

This chapter is to serve as a guide for selecting and designing the most useful and cost-effective bicycle facility possible and for how to include the region's Bicycle Coordinator in the design process. These guidelines apply to normal situations encountered during project development. Unique design problems are resolved on a project-by-project basis using guidance from the region's Bicycle Coordinator.

State law (46.61.710 RCW) prohibits the operation of mopeds on facilities specifically designed for bicyclists, pedestrians, and equestrians. Mopeds are not considered in the design process for the purposes of this chapter.

In general, do not mix equestrian and bicycle traffic on a shared use path. Consider designing a bridle trail that is separate from the shared use path in common equestrian corridors.

1020.02 References

Guide for the Development of Bicycle Facilities, 1999, AASHTO

*A Policy on Geometric Design of Highways and Streets (*Green Book), 1994, AASHTO

Manual on Uniform Traffic Control Devices (MUTCD), Federal Highway Administration (FHWA), National Advisory Committee on Uniform Traffic Control Devices including the *Washington State Modifications to the MUTCD,* M 24-01, WSDOT

Washington Administrative Code (WAC) 468-95-035, Pavement Edge and Raised Pavement Markers Supplementing Other Markings

Revised Code of Washington (RCW) 46.61, Rules of the Road

RCW 46.61.710, Mopeds, electric-assisted bicycles—General requirements and operation

*Standard Plans for Road, Bridge, and Municipal Construction (*Standard Plans*),* M 21-01, WSDOT

State Highway System Plan, WSDOT

1020.03 Definitions

bicycle route A system of bikeways, designated by the jurisdiction(s) having the authority, featuring appropriate directional and informational route markers. A series of bikeways may be combined to establish a continuous route and may consist of any or all types of bicycle facilities.

bike lane A portion of a highway or street identified by signs and/or pavement markings reserved for bicycle use.

bikeway Any trail, path, part of a highway or shoulder, or any other traveled way specifically signed and/or marked for bicycle travel.

Category A bicyclist Advanced or experienced riders who are generally using their bicycles as they would a motor vehicle. They want direct access to destinations with a minimum of delay and are comfortable riding with motor vehicle traffic. When touring, their vehicles are commonly heavily loaded with a tandem rider(s), children, or camping gear. They need sufficient operating space on the traveled way or shoulder to eliminate the need for them or passing vehicles to shift position.

Category B bicyclist Basic or less confident adult bicyclists who might be using their bicycles for transportation purposes. They prefer to avoid roads with fast and busy motor vehicle traffic unless there is ample roadway width. Basic bicyclists are comfortable riding on neighborhood streets and shared use paths; however, on busier streets, they prefer designated facilities such as bike lanes or wide shoulder lanes.

Category C bicyclist Children, riding alone or with their parents, who need access to key destinations in the community such as schools, friends, recreational facilities, and convenience stores. Residential streets with low motor vehicle speeds (linked with shared use paths and busier streets with well-defined pavement marking between bicycles and motor vehicles) can accommodate children without encouraging them to ride in the traveled lane of major arterials.

rural bicycle touring routes State highways or sections of state highways that are used or have a high potential for use by Category A bicyclists riding long distance on single or multiday trips.

shared roadway A roadway that is open to both bicycle and motor vehicle travel. Shared roadways do not have dedicated facilities for bicycle travel.

signed shared roadway (designated as a bike route) A shared roadway that has been designated by signing as a preferred route for bicycle use. Appropriate bike route signs are installed to assure bicyclists that improvements such as widening shoulders have been made to improve safety.

shared use path A facility on exclusive right of way with minimal cross flow by motor vehicles. It is designed and built primarily for use by bicycles but is also used by pedestrians, joggers, skaters, wheelchair users (both nonmotorized and motorized), and others.

1020.04 Planning

(1) General

Bikeway planning includes provisions and facilities for safe and efficient bicycle travel. An effective multimodal transportation program addresses the issue of upgrading highways to accommodate shared use by bicyclists and motorists.

Bicyclists of all skill levels will use well-designed facilities. Bicyclists will avoid a poorly designed facility.

To enhance bicycle travel, consider upgrading existing roads that are used regularly by Category A or B bicyclists. The upgrading includes improving the width and quality of the surface and maintaining the right-hand portion in a condition suitable for bicycle riding.

Consider bicycle facilities when designing construction projects and normal safety and operational improvements. Shoulder widening projects along existing highways, might be an opportunity to encourage bicycle traffic and enhance bicycle safety. Correcting short areas of restricted width (such as bridges, cuts, or fills) to provide bikeways might not be cost effective. However, the presence of these short, restricted areas does not diminish the importance of widening the adjoining shoulder sections.

Bikeway planning is an integral part of the facility planning for other transportation modes and land use development. Use the location criteria that follow for long-term planning and project development as applicable.

(2) Programming

The *State Highway System Plan* identifies two elements of bicycle project funding:

- Urban Bicycle Projects: Complete local bicycle networks by building short sections of appropriate bicycle facilities along or across state highways.
- Rural Bicycle Touring Routes: Shoulder improvements along sections of designated state routes.

Urban Bicycle Projects have been prioritized by the region's Planning Offices, the OSC Bicycle Program, and the department's Bicycle Advisory Committee and are listed in the *State Highway System Plan*. Urban Bicycle Projects are selected in each region, prioritized, and will compete for funding.

Rural Bicycle Touring Routes (RBTR) programming priority areas are listed in the *State Highway System Plan*. Each region's Planning Office has a map with the priority areas marked. The purpose of the RBTR program is to add funding to a project in an RBTR shoulder deficiency area. Designers are to consult the region's Planning Office to determine if their project is within an RBTR shoulder deficiency area. If the project is within an RBTR shoulder deficiency area, the designer requests the region's Program Management to determine RBTR funding availability.

Consider spot bikeway improvements in other types of projects such as P1 paving and I2 safety improvement projects. Identify small improvements in the project definition phase. Consult the region's Bicycle Coordinator for recommendations and the limits of the work. Funding from other sources such as the Urban Bicycle and Rural Bicycle programs might be available.

(3) Selection of the Type of Facility

In selecting an appropriate facility, ensure that the proposed facility will not encourage or require bicyclists or motorists to operate in a manner that is inconsistent with the Rules of the Road (RCW 46.61).

An important consideration is route continuity. Alternating bikeways from side to side along a route is generally unacceptable. Designing a route that requires bicyclists to cross the roadway could result in inappropriate maneuvers and/or encourage Rules of the Road violations. In addition, wrong-way bicycle travel might occur beyond the ends of shared use paths because of the inconvenience of having to cross the street.

Many factors are involved in determining which type of facility will benefit the greatest number of bicyclists. Outlined below are the most common applications for each type.

Shared Use Path
Figure 1020-1

(a) **Shared Use Path.** The most common applications for shared use paths (See Figure 1020-1) are along rivers and streams, ocean beachfronts, canals, utility rights of way, and abandoned railroad rights of way; within college campuses; and within and between parks. There might also be situations where such facilities can be provided as part of planned developments. Another common application of shared use paths is to close gaps in bicycle travel caused by construction of freeways, or the existence of natural barriers (rivers, mountains, and other large geographic features).

Generally, shared use paths are used to serve corridors not served by streets and highways or where wide rights of way exist permitting such facilities to be constructed away from the influence of parallel roadways. Shared use paths offer opportunities not provided by the road system. They can either provide a recreational opportunity or serve to minimize motor vehicle interference by providing direct high-speed bicycle commute routes.

Bike Lane
Figure 1020-2

Shared Roadway
Figure 1020-3

(b) **Bike Lane.** Bike lanes are established along streets in corridors where there is or, in the future, might be significant bicycle demand. (See Figure 1020-2.) Bike lanes delineate the rights of way assigned to bicyclists and motorists and provide for movements that are more predictable by each. An important reason for establishing bike lanes is to better accommodate bicyclists through corridors where insufficient room exists for safe bicycling on existing streets. This can be accomplished by reducing the number of lanes or prohibiting parking in order to delineate bike lanes.

Where street improvements are not possible, improve the bicyclist's environment by providing shoulder sweeping programs and special signal facilities.

When considering the selection of appropriate streets for bike lanes, refer to the location criteria discussed in 1020.04(4).

Do not designate sidewalks as bike lanes.

(c) **Shared Roadway.** Most bicycle travel in Washington occurs on highways and streets without bikeway designations. (See Figure 1020-3.) In most instances, entire street systems are fully adequate for safe and efficient bicycle travel and signing and pavement markings for bicycle use are unnecessary.

The region's Traffic are responsible for determining sections of state highways where bicycle traffic is inappropriate. The State Traffic Engineer, after consultation with the Bicycle Advisory Committee, prohibits bicycling on sections of state highways through the traffic regulation process. Also, see Chapter 1420 "Access Control Design Policy".

Bicyclists traveling between cities, or on recreational trips, may use many rural highways. In most cases, rural highways are not designated as bike routes because of the limited use and the lack of continuity with other bike routes. However, the development and maintenance of paved shoulders, with or without a standard edge stripe, can significantly improve safety and convenience for bicyclists and motorists along such routes.

Signed Shared Roadway
(Designated Bike Route)
Figure 1020-4

(d) **Signed Shared Roadway.** Designate signed shared roadways as bike routes by posting bike route signs. (See Figure 1020-4.) These routes provide continuity to other bicycle facilities and designate preferred routes through high bicycle-demand corridors. As with bike lanes, designating shared roadways as bike routes is an indication to bicyclists that there are particular advantages to using these bike routes as compared with alternative routes. This means that the responsible agencies have taken action to ensure that these routes are suitable as bike routes and are maintained in a manner consistent with the needs of bicyclists. Signing also alerts motor vehicle operators that bicycles are present.

Use the following criteria to aid in determining whether or not to designate and sign a bike route:

- The route offers a higher degree of service than alternative streets.
- It provides for through and direct travel in bicycle-demand corridors.
- It connects discontinuous segments of bikeways.
- Traffic control devices have been adjusted to accommodate bicyclists.
- Street parking is restricted for improved safety where lane width is critical.
- Surface hazards to bicyclists have been corrected.
- Maintenance of the route is to a higher standard than comparable streets, such as more frequent street sweeping and repair.

In general, do not designate sidewalks as bikeways for the following reasons:

- Sidewalks tend to be used in both directions, despite any signing to the contrary.
- At approaches to intersections, parked cars might impede sight distance of motorists and bicyclists. At driveways, property fences, shrubs, and other obstructions often impair sight distances.
- At intersections, motorists are not looking for bicyclists entering the crosswalk area, particularly when motorists are making a turn.
- Sidewalks are typically designed for pedestrian speeds, and might not be safe for higher-speed use. Conflicts between bicyclists and pedestrians are common, as are conflicts with fixed objects such as parking meters, utility poles, signposts, bus shelters, benches, trees, hydrants, and mailboxes. In addition, bicyclists riding on the curb side of sidewalks might accidentally drop off the sidewalk into the path of motor vehicle traffic.

Only consider a sidewalk as a bike route under special circumstances, such as on long, narrow bridges. Even then, the preferred solution is to widen the roadway to provide space for bicyclists. In residential areas, sidewalk riding is commonly done by Category B and C bicyclists who are not comfortable riding in the street. However, it is inappropriate to sign these facilities as bike routes.

(4) Location Criteria

Factors to consider in determining the location of a bikeway are:

(a) **Potential Use.** Locate bikeways along corridors or a convenient road parallel to the corridor to maximize use. However, to attract commuting bicyclists, the roadway must offer through route conditions.

(b) **Directness.** Locate facilities along a direct line and in such a way that they connect bicycle traffic generators for the convenience of the users. Bicyclists are interested in the same destinations as motorists.

(c) **Access.** When locating a shared use path, provide adequate access points. The more access points, the more the facility will be used. Adequate access for emergency and service vehicles is also necessary.

(d) **Shared Use Path Widths.** Figure 1020-13 shows the widths and minimum horizontal clearances needed when a shared use path is on an alignment separate from a highway right of way.

Figure 1020-14 shows shared use path width when adjacent to a roadway and within its right of way. See 1020.05(2)(e) to find if a barrier will be needed.

(e) **Available Roadway Width.** For a bike lane or shared roadway (with or without signing), the overall roadway width must meet or exceed the highway minimum design criteria. See Chapter 430 "Modified Design Level" and 440 "Full Design Level" and Figures 1020-14 and 1020-15 for further width information.

(f) **On-Street Motor Vehicle Parking.** Consider the density of on-street parking and the safety implications, such as opening car doors. If possible, select a route where on-street parking is light or where it can be prohibited.

(g) **Delays.** Bicyclists have a strong desire to maintain momentum. If bicyclists are required to make frequent stops, they might avoid the route.

(h) **Traffic Volumes and Speeds.** For an on-street bikeway, the volume and speed of auto traffic, along with the available width, are factors in determining the best location. Commuting bicyclists generally ride on arterial streets to minimize delay and because they are normally the only streets offering continuity for trips of several miles. The FHWA has developed a spreadsheet to evaluate roadways for bicycle compatibility. The Bicycle Compatibility Index (BCI) measures roadways based on traffic volume, speed, lane width, and other factors. A copy of the BCI and supporting information is found at http://www.hsrc.unc.edu/research/pedbike/bci/index.html

(i) **Truck and Bus Traffic.** High-speed truck, bus, and recreational vehicle traffic can cause problems along a bikeway because of aerodynamic effects and vehicle widths. Evaluate the need to widen shoulders or change the location of the bicycle facility if it is on a roadway with this type of traffic.

(j) **Existing Physical Barriers.** In some areas there are physical barriers to bicycle travel caused by topographical features such as rivers, limited access highways, or other impediments. In such cases, developing a facility that allows a bikeway to cross an existing barrier can provide access opportunities for bicyclists.

(k) **Collision History.** Check the collision experiences along a prospective bicycle route to determine its relative safety compared to other candidate routes. This involves analysis of the collision types to determine which of them might be reduced. (See 1020.04(4)(p).) Consider both the impacts caused by adding bicycle traffic and the potential for introducing new accident problems. The region's Traffic Office is a good resource when considering collision factors.

(l) **Grades.** Avoid steep grades on bikeways whenever possible. Refer to 1020.05(2)(k) for specific criteria.

(m) **Pavement Surface Quality.** Establish an on-street bikeway only where pavement can be brought to a reasonable condition for safe bicycle travel. Dense graded asphalt concrete surfaces are preferable to open-graded asphalt concrete, Portland cement concrete, and seal-coated surfaces.

(n) **Maintenance.** Ease of maintenance is an important consideration in locating and developing a bikeway. Consider the ease of access by maintenance vehicles. Bicyclists will often shun a poorly maintained bikeway in favor of a parallel roadway. Consult with area maintenance personnel during the planning stage.

(o) **Environmental Compatibility.** Consider scenic value, erosion and slope stability, and compatibility with the surrounding terrain when developing a bikeway. Provide landscaping to minimize adverse environmental effects.

(p) **Use Conflicts.** Different types of facilities produce different types of conflicts. On-street bikeways involve conflicts with motor vehicles. Shared use paths usually involve conflicts with other bicyclists, pedestrians, skaters, and runners on the path, and with motor vehicles at street intersections. Conflicts between bicyclists and motorists can also occur at highway and driveway intersections, tight corners, and narrow facilities like bridges and tunnels.

(q) **Security.** The potential for criminal acts against bicyclists and other users of bikeways exists anywhere, especially along remote stretches. There also is the possibility of theft or vandalism at parking locations. Consult local law enforcement agencies for guidance in making these areas safer. Also consider installation of telephones in high risk areas.

(r) **Cost/Funding.** Location selection will normally involve a cost comparison analysis of alternatives. Funding availability will often eliminate some alternatives; however, it is more desirable to delay constructing a bicycle facility than to construct an inadequate facility.

(s) **Structures.** Continuity can be provided to shared use path by using an overpass, underpass, tunnel, bridge, or by placing the facility on a highway bridge to cross obstacles. See 1020.05(2)(m) for design information.

Retrofitting bicycle facilities on existing bridges involves a large number of variables; compromises in desirable design criteria are often inevitable. The planner, with the assistance of the region's Bicycle Coordinator and the Bridge and Structures Office, on a case-by-case basis, will determine the desirable design criteria.

Consider the following alternatives when placing a shared use path on an existing highway bridge:

- On one side of a bridge. Do this where: the bridge facility connects at both ends to the path; there is sufficient width on that side of the bridge or additional width can be gained by remarking the pavement; and provisions have been made to physically separate the motor vehicle traffic from the bicycle traffic. See Figure 1020-16.
- Provide bicycle lanes, shoulders, or wide curb lanes over a bridge. This is advisable where: bike lanes and shoulders connect on either end of the structure, and when sufficient width exists or can be obtained by widening or remarking the pavement. Use this option only if the bike lane or wide outside lane can be accessed without increasing the potential for wrong-way riding or inappropriate crossing movements.

(v) **Lighting.** Illumination of bicycle facilities might be necessary to achieve minimum levels of safety, security, and visibility.

(w) **Support Facilities.** Where bicycles are used extensively for utility trips or commuting, consider placing adequate bicycle parking and/or storage facilities at common destinations (such as park and ride lots, transit terminals, schools, and shopping centers). Contact the region's Bicycle Coordinator for additional information.

1020.05 Design

(1) Project Requirements

For urban bicycle mobility improvement projects (Bike/Ped connectivity projects in the matrices, Chapter 325), apply the guidance in this chapter to the bikeway.

For highway design elements affected by the project, apply the appropriate design level (Chapter 325) and as found in the applicable *Design Manual* chapters.

For highway design elements not affected by the project, no action is required.

(2) Design Criteria for Shared Use Path

Shared use paths are facilities for the primary use of bicyclists but are also used by pedestrians, joggers, skaters, and others.

(a) **Widths.** The geometric guidelines for shared use paths are shown in Figures 1020-13 and 1020-14.

A path width of 8 ft may be used when all the following conditions apply:

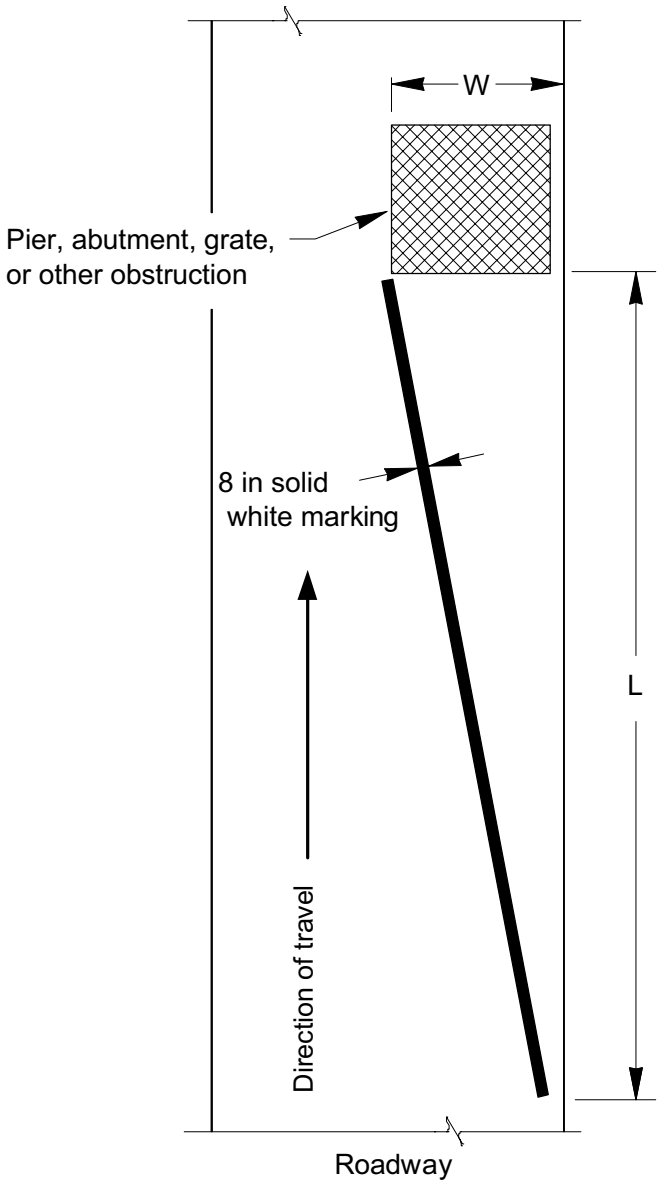
- Bicycle traffic is expected to be low (less than 60 bicycles per day [bpd]).
- Pedestrian use is not expected to be more than occasional.
- The horizontal and vertical alignment adequately provide safe and frequent passing opportunities.
- Normal maintenance activities can be performed without damaging the pavement edge.

The minimum paved width for a one-way shared use path is 6 ft. Use this minimum width only after ensuring that one-way operation will be enforced and maintenance can be performed.

Where the shared use path is adjacent to canals, ditches, or fill slopes steeper than 3H:1V, consider a wider separation. A minimum 5 ft separation from edge of the pavement to the top of slope is desirable. A physical barrier, such as dense shrubbery, railing, or chain link fence is needed at the top of a high embankment and where hazards exist at the bottom of an embankment.

(b) **Clearance to Obstructions**. The desirable horizontal clearance from the edge of pavement to an obstruction (such as a bridge pier) is at least 2 ft. Where this cannot be obtained; install signs and pavement markings to warn bicyclists of the condition. See Figure 1020-5 for pavement marking details.

The required minimum vertical clearance from bikeway pavement to overhead obstructions is 8 ft. However, a higher vertical clearance might be needed for passage of maintenance and emergency vehicles.



L = WV, where V is bicycle approach speed (mph)

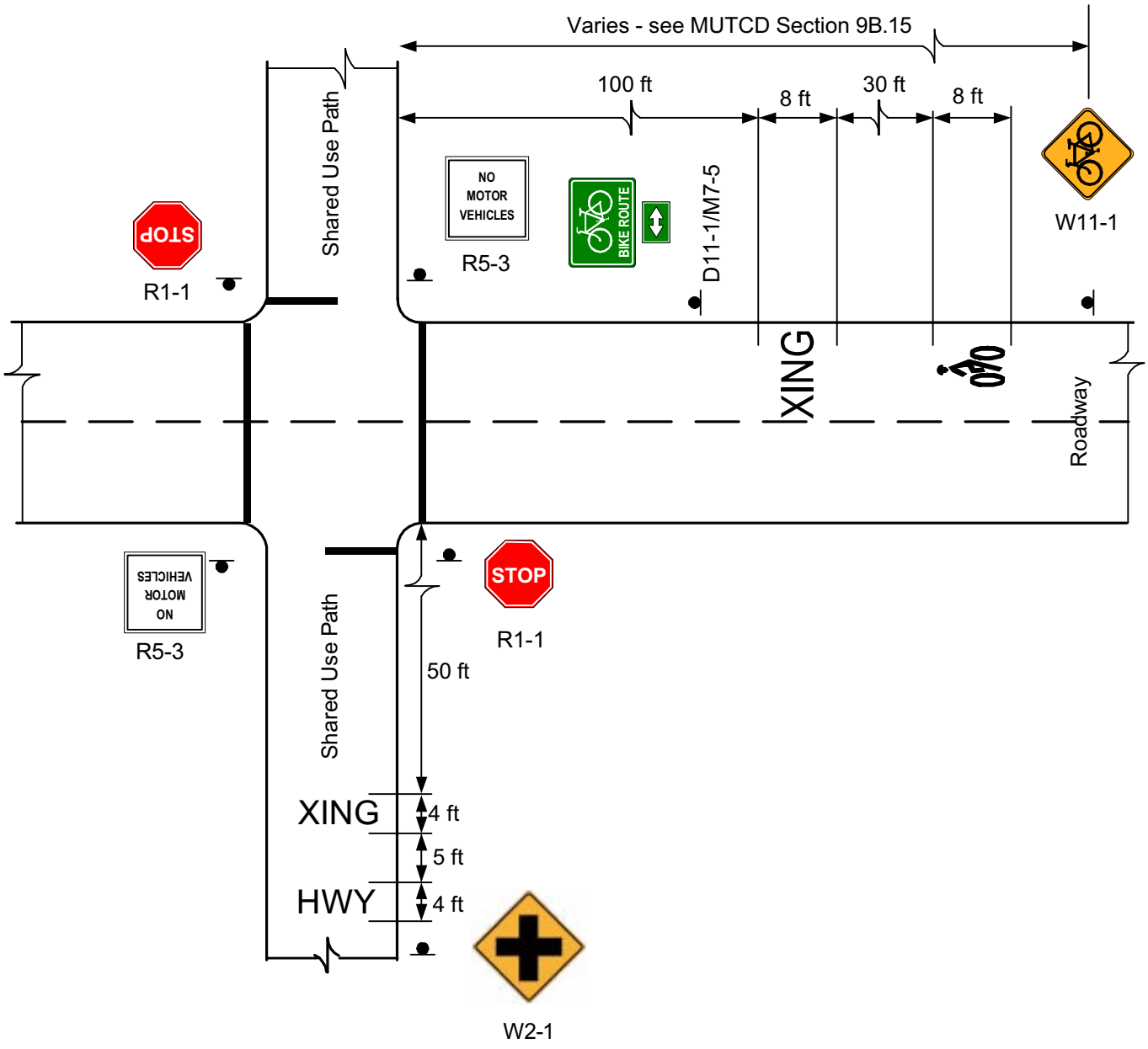
Obstruction Marking
Figure 1020-5

(c) **Intersections with Highways.** Collisions at intersections are the most common type of motor vehicle/bicycle collision. Shared use path and roadway intersections must clearly define who has the right of way and provide adequate sight distance for both users. There are three types of shared use path/roadway at-grade intersection crossings: midblock, adjacent path, and complex. Only at-grade midblock and adjacent crossings are addressed here. Complex intersections involve special designs which must be considered on a case-by-case basis.

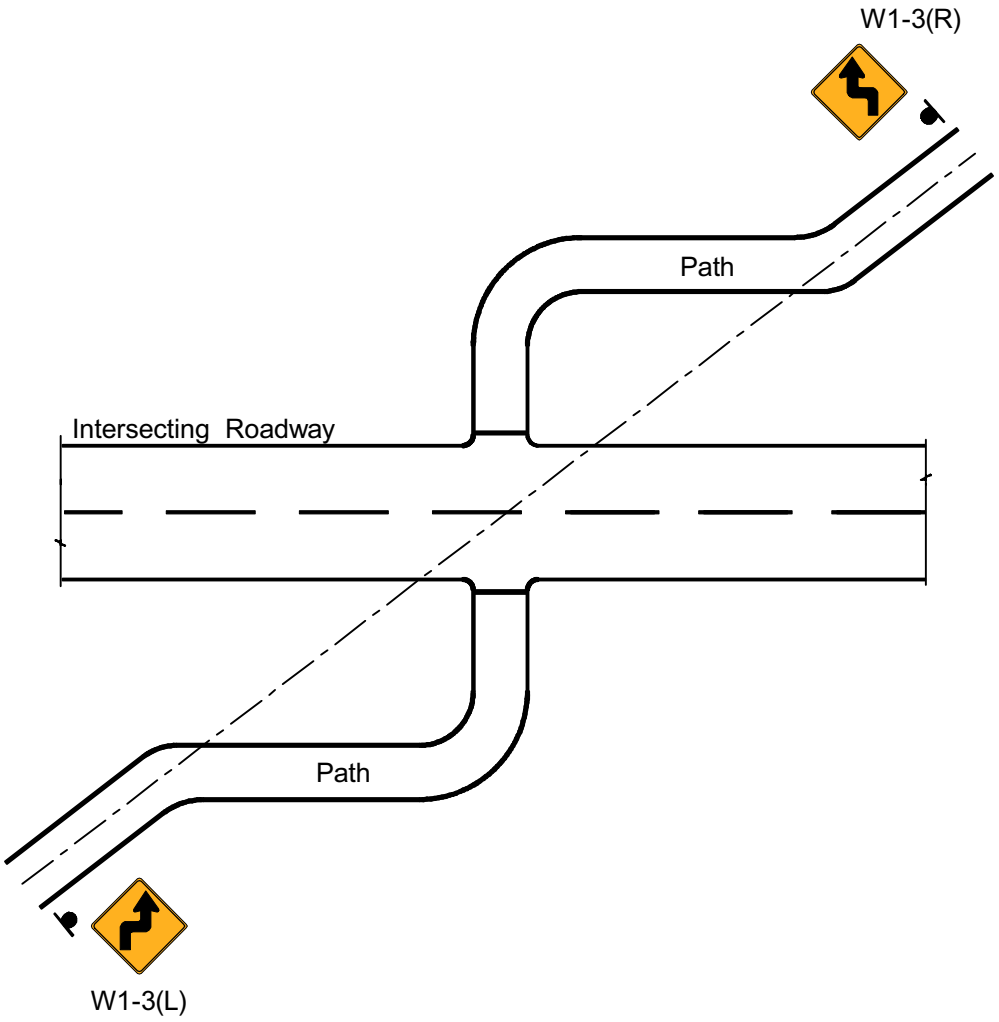
At-grade crossings at existing intersections are usually placed with existing pedestrian crossings where motorists can be expected to stop. If alternate intersection locations for a shared use path are available, select the one with the greatest sight distance.

When possible, place a crossing away from an intersection in order to eliminate conflicts.

Midblock crossings are the least complex of the other types of crossings. Locate midblock path crossings far enough away from intersections so that there is no conflict between the path crossing and the intersection motor vehicle traffic activities. A 90-degree intersection crossing is preferable (Figure 1020-6). A 75-degree angle is acceptable. A 45-degree angle is the minimum acceptable to minimize right of way requirements. A diagonal midblock crossing can be altered as shown in Figure 1020-7.



Midblock Type Shared Use Path Crossing
Figure 1020-6



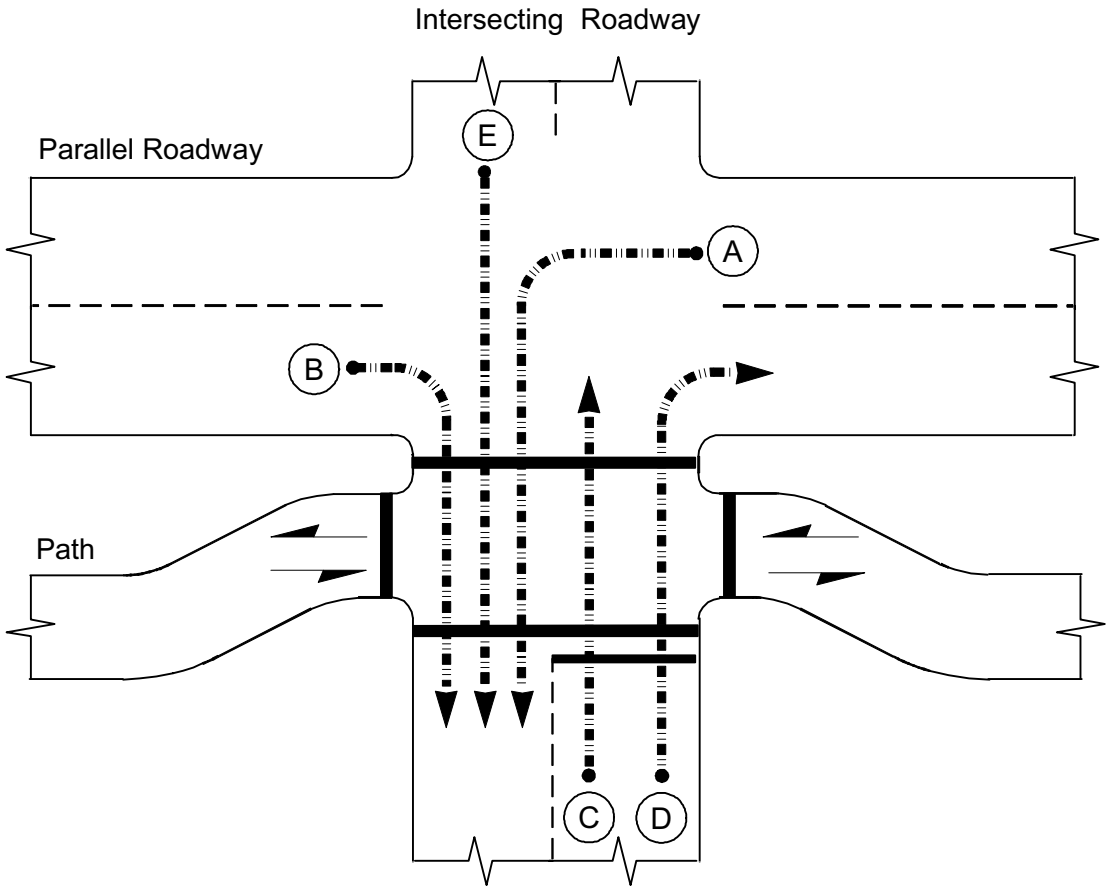
Note: The path and highway signing and markings are the same as in Figure 1020-6

Typical Redesign of a Diagonal Midblock Crossing
Figure 1020-7

There are other considerations when designing midblock crossings, including right of way assignment, traffic control devices, sight distances for both bicyclists and motor vehicle operators, refuge island use, access control, and pavement markings.

Adjacent path crossings occur where a path crosses an existing intersection of two roadways, a T intersection (including driveways), or a four-way intersection as shown in Figure 1020-8. It is preferable to integrate this type of crossing close to an intersection so that motorists and path users recognize each other as intersecting traffic. The path user faces potential conflicts with motor vehicles turning left (A) and right (B) from the parallel roadway, and on the crossed roadway (C, D, E).

Complex intersection crossings are all other types of path/roadway or driveway junctions. These include a variety of configurations where the path crosses directly through an existing intersection of two or more roadways and where there can be any number of motor vehicle turning movements.



Note: Signing will be the same as shown in Figure 1020-6.

Adjacent Shared Use Path Intersection
Figure 1020-8

Improvements to complex crossings must be considered on a case-by-case basis. Suggested improvements include: move the crossing, install a signal, change signization timing, or provide a refuge island and make a two-step crossing for path users.

The major road might be either the parallel or the crossed roadway. Important elements that greatly affect the design of these crossings are: right of way assignment, traffic control devices, and separation distance between path and roadway.

Other roadway/path design considerations:

- **Traffic signals/stop signs**. Determine the need for traffic control devices at all path/roadway intersections by using MUTCD warrants and engineering judgment. Bicycles are considered vehicles in Washington State and bicycle path traffic can be classified as vehicular traffic for MUTCD warrants. Ensure that traffic signal timing is set for bicycle speeds.
- **Manually operated signal actuation mechanisms.** Locate the bicyclist's signal button where it is easily accessible to bicyclists and 4 ft above the ground and place a detector loop in the path pavement.
- **Signing**. Place path stop signs as close to the intended stopping point as possible. Four-way stops at shared use path and roadway intersections are not advisable due to confu-

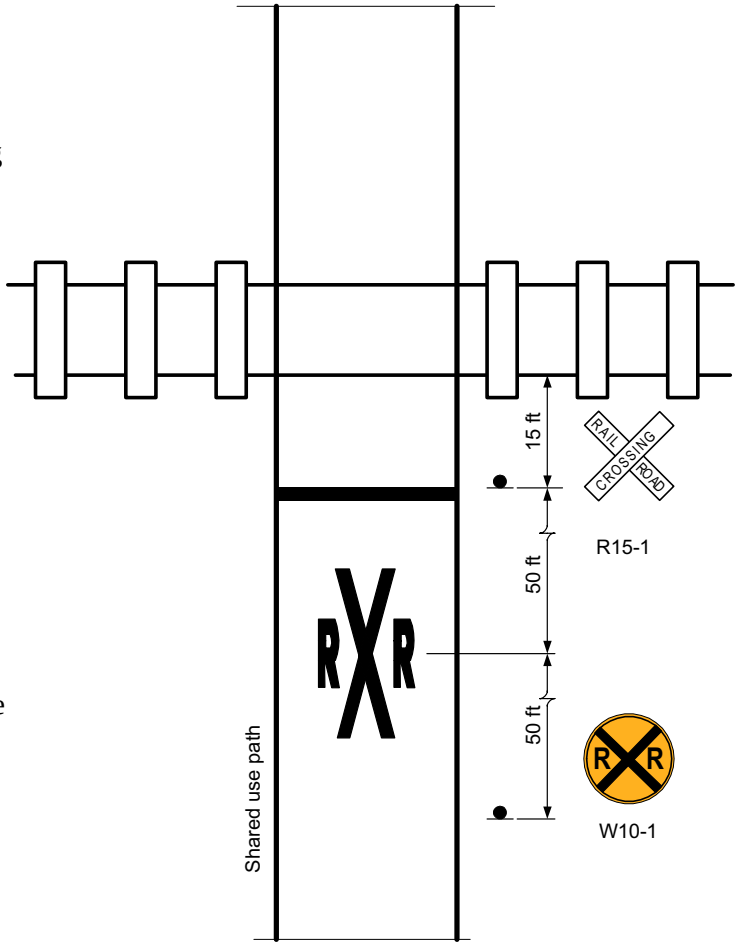
sion about or disregard for right of way laws. Yield signs for path traffic are acceptable at some locations, such as low-volume, low-speed neighborhood streets. Sign type, size, and location must be in accordance with the MUTCD. Do not place the shared use path signs where they will confuse motorists or place roadway signs where they will confuse bicyclists.

- **Approach treatments.** Design shared use path and roadway intersections with flat grades and adequate sight distances. Evaluate stopping sight distance at the intersection. Provide adequate advance warning signs and pavement makings (see MUTCD and Washington State Modifications to the MUTCD) that alert and direct bicyclists to stop before reaching the intersection, especially on downgrades. Provide unpaved shared use paths with paved aprons extending a minimum of 10 ft from the paved road surfaces. Speed bumps or other similar surface obstructions intended to cause bicyclists to slow down are not appropriate.
- **Transition zones.** Integrate the shared use path into the roadway where the path terminates. Design these terminals to transition the bicycle traffic into a safe merging or diverging condition. Appropriate signing is necessary to warn and direct both bicyclist and motorist at the transition areas.
- **Ramp widths.** Design ramps for curb cuts with the same width as the shared use path. Curb cuts and ramps are to provide a smooth transition between the shared use path and the roadway. Consider a 5 ft radius or flare to facilitate right turns for bicycles. This same consideration applies to intersections of two shared use paths.
- **Refuge islands**. Consider refuge islands when one or more of the following applies: high motor vehicle traffic volume and speeds; wide roadways; crossing will be used by elderly, children, disabled, or other slow moving users. See Figure 1020-17 for details.

(d) **At-Grade Railroad Crossings**. Whenever a bikeway crosses railroad tracks, continue the crossing at least as wide as the approach bikeway. Wherever possible, design the crossing at right angles to the rails. See Figure 1020-18.

For on-street bikeways, where a skew is unavoidable, widen the shoulder (or bike lane) to permit bicyclists to cross at right angles. If this is not possible, consider using special construction and materials to keep the flangeway depth and width to a minimum.

Seen Figure 1020-9 and the MUTCD for the signing and marking for a shared use path crossing a railroad track.



Railroad Crossing for Shared Use Path
Figure 1020-9

(e) **Separation, Barrier, and Fencing.** When possible, provide a wide separation between a shared use path and the traveled way where the path is located near the traveled way.

If the shared use path is inside the Design Clear Zone, provide a traffic barrier. (See Chapter 700, "Roadside Safety," for Design Clear Zone. See Chapter 710, "Traffic Barriers," for barrier location and deflection.) A concrete barrier presents less of a hazard to bicyclists than a W-beam guardrail and is preferred. However, if the edge of the path is farther than 10 ft from the barrier, a W-beam guardrail is also acceptable.

If the roadway shoulder is less than 6 ft wide and the edge of path is within 5 ft of a barrier, provide a taller barrier (minimum of 42") to reduce the potential for bicyclists falling over the barrier into the traveled way. If the roadway shoulder is more than 6 ft wide and the edge of path is more than 5 ft from a barrier, a standard height barrier may be used.

Where the path is to be located next to a limited access facility, there is also a need for an access barrier. Where space permits, fencing, as is described in Chapter 1460, can be provided in conjunction with a standard height barrier. Otherwise, provide a taller barrier (54" minimum height). Provide a taller barrier (54"minimum) on structures specifically designed for bicycle use as is shown on Figure 1020-16.

Fencing between a shared use path and adjacent property may also be necessary to restrict access to the private property. Discuss the need for fencing and the appropriate height with the property owners during project design.

Consider the impacts of barriers and fencing on the sight distances.

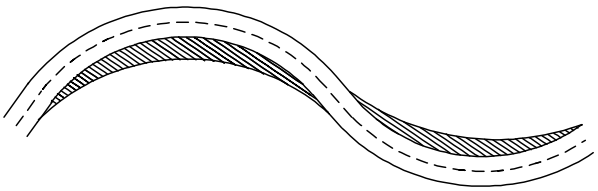
(f) **Design Speed.** The design speed for a shared use path is dependent on the expected conditions of use and on the terrain. See Figure 1020-10 for values.

Conditions	Design Speed MPH	Min. Curve Radius Ft
Open country (level or undulating); separate shared use path in urban areas	20	65
Long down grades (steeper than 4% and longer than 500 ft)	30	145

Bicycle Design Speeds
Figure 1020-10

(g) **Horizontal Alignment and Superelevation.** A straight 2% cross slope on tangent path sections is recommended. This is the maximum superelevation used. A greater superelevation can cause maneuvering difficulties for adult tricyclists and wheelchair users.

Increase pavement width up to 4 ft on the inside of a curve to compensate for bicyclist lean. (See Figure 1020-11.) In sharp curve conditions, consider center line pavement marking on two way facilities.



Standard bikeway curve widening

Radius	Additional Pavement Width
0 ft – 25 ft	4 ft
25 ft – 50 ft	3 ft
50 ft – 75 ft	2 ft
75 ft – 100 ft	1 ft
100 ft +	0 ft

Bikeway Curve Widening
Figure 1020-11

(h) **Stopping Sight Distance.** Figure 1020-19 indicates the minimum stopping sight distances for various design speeds and grades. The values are based on a 4.5 ft eye height for the bicyclist and 0 ft height for the object (roadway surface). On grades, the descending direction controls the design for two-way shared use paths. (Passing sight distance is not considered due to the relatively low speed of bicyclists. Intersection sight distance is not a consideration because of the presence of either signals or stop signs at roadway crossings.)

(i) **Sight Distance of Crest Vertical Curves.** Figure 1020-20, Sight Distance for Crest Vertical Curves, indicates the minimum lengths of crest vertical curves for varying design speeds.

(j) **Lateral Clearance on Horizontal Curves.** Figure 1020-21 indicates the minimum clearances to line-of-sight obstructions for horizontal curves. Obtain the lateral clearance by entering, on the chart, the stopping sight distance from Figure 1020-19 and the proposed horizontal curve radius. Where minimum clearances cannot be obtained, provide standard curve warning signs and use supplemental pavement markings in accordance with the MUTCD.

(k) **Grades.** Some bicyclists are unable to negotiate long, steep uphill grades. Long downgrades can also cause problems on shared use paths. The maximum grade recommended for a shared use path is 5%. It is desirable that sustained grades (800 ft or longer) be limited to 2% to accommodate a wide range of users.

The following grade length limits are suggested:

5-6% for up to 800 ft
7% for up to 400 ft
8% for up to 300 ft
9% for up to 200 ft
10% for up to 100 ft
11+% for up to 50 ft

Grades steeper than 3% might not be practicable for shared use paths with crushed stone or other unpaved surfaces for both bicycle handling and traction, and for drainage and erosion reasons.

Options to mitigate steep grades are:

- When using a steeper grade add an additional 4 to 6 ft of width to permit slower speed maneuverability and to provide a place where bicyclists can dismount and walk.
- Use signing in accordance with MUTCD to alert bicyclists of the steep down grades and the need to control their speed.
- Provide adequate stopping sight distance.
- Increase horizontal path side clearances (4 to 6 ft is recommended), and provide adequate recovery area and/or bike rails.

(l) **Pavement Structural Section.** Design the pavement structural section of a shared use path in the same manner as a highway, considering the quality of the subgrade and the anticipated loads on the bikeway. Principle loads will normally be from maintenance and emergency vehicles.

Unless otherwise justified, use asphalt concrete pavement (ACP) in the construction of a shared use path. Asphalt concrete pavement is to be 0.20 ft thick.

Contact the Materials Laboratory for determination of the subgrade R value.

R Value	Subsurfacing Thickness (ft)
< 40	0.35
40 to 65	0.25
> 65	0.20

R Values and Subsurfacing Needs
Figure 1020-12

(m) **Structures.** Structures intended to carry a shared use path only are designed using pedestrian loads and emergency and maintenance vehicle loading for live loads. Provide the same minimum clear width as the approach paved shared use path, plus the graded clear areas. See Figure 1020-13 for path and graded areas.

Carrying full widths across all structures has two advantages:

- The clear width provides a minimum horizontal shy distance from the railing or barrier.
- It provides needed maneuvering room to avoid pedestrians and other bicyclists who have stopped on the bridge.

Undercrossings and tunnels are to have a minimum vertical clearance of 10 ft from the bikeway pavement to the structure. This allows access by emergency, patrol, and maintenance vehicles on the shared use path.

See Figure 1020-16 for barrier and rail placement on bridges. Consult with Maintenance and the Bridge Preservation Office to verify that these widths are adequate for their needs. If not, widen to their specifications.

Provide a smooth, nonskid surface for bicycles to traverse bridges with metal grid bridge decking. The sidewalk may be used as a bikeway or place signs instructing the bicyclist to dismount and walk for the length of a bridge with this type of decking.

Use bicycle-safe expansion joints for all decks with bikeways.

(n) **Drainage.** Sloping the pavement surface to one side usually simplifies longitudinal drainage design and surface construction and is the preferred practice. (See 1020.05(2)(g) for maximum permitted slope.) Generally, surface drainage from the path will be adequately dissipated as it flows down the gently sloping shoulder. However, a shared use path constructed on the side of a hill might require a drainage ditch on the uphill side to intercept the hillside drainage. Where necessary, install catch basins with drains to carry intercepted water under the path. Refer to Chapter 1210 for other drainage criteria.

Locate drainage inlet grates and manhole covers off the pavement of shared use paths. If manhole covers are needed on a path, install them to minimize the effect on bicyclists. Manhole covers are installed level with the surface of the path.

Drainage inlet grates on bikeways must have openings narrow enough and short enough to ensure that bicycle tires will not drop into the grates. Where it is not immediately feasible to replace existing grates with standard grates designed for bicycles or where grate clogging is a problem, steel cross straps may be installed with a spacing of 6 to 8 inches on centers, to adequately reduce the size of the openings.

(o) **Bollards.** Install bollards at entrances to shared use paths to prevent motor vehicles from entering. When locating such installations, ensure that barriers are well marked and visible to bicyclists, day or night. Installing reflectors or reflectorized tape are ways to provide visibility. See Standard Plan H-13 Type 1 Bollard.

A single bollard installed in the middle of the path reduces the users' confusion. Where more than one post is necessary, use 5 ft spacing to permit passage of bicycle-towed trailers, wheelchairs, and adult tricycles and to ensure adequate room for safe bicycle passage without dismounting. Design bollard installations so they are removable to permit entrance by emergency and service vehicles, and with breakaway features when in the Design Clear Zone. Ensure that the bollard sleeve is flush with pavement surface.

(p) **Signing and Pavement Markings.** Refer to the MUTCD for guidance and directions for signing and pavement markings for bikeways. Consider a 4 in yellow center line to separate opposing directions of travel where there is heavy use, on curves where there is restricted sight distance, and where the path is unlighted and nighttime riding is expected. A 4 in white line on each edge of the path helps to delineate the path if nighttime use is expected. Lateral and vertical clearance for signs is shown on Figure 1020-13.

(q) **Lighting**. The level of illumination required on a bicycle facility is dependent upon the amount of nighttime use expected and the nature of the area surrounding the facility Refer to Chapter 840 for additional guidance concerning illumination of bikeways. Bikeway/roadway intersection lighting is recommended.

(3) Design Criteria for Bike Lane

(a) **Widths**. Some typical bike lane configurations are illustrated in Figure 1020-15 and are described below:

Figure 1020-15, Design A, depicts bike lanes on an urban-type curbed street where parking stalls (or continuous parking stripes) are marked. Locate bike lanes between the parking area and the traffic lanes. Minimum widths are shown.

Do not place bike lanes between the parking area and the curb. Such facilities create hazards for bicyclists, such as opening car doors and poor visibility at intersections. Also, they prevent bicyclists from leaving the bike lane to turn left and they cannot be effectively maintained.

Figure 1020-15, Design B, depicts bike lanes on an urban-type curbed street, where parking is permitted. Establish bike lanes in conjunction with the parking areas. As indicated, 12 ft is the minimum width of the bike lane where parking is permitted. This type of lane is satisfactory where parking is not extensive and where turnover of parked cars is infrequent. However, an additional width of 1 to 2 ft is recommend if parking is substantial or turnover of parked cars is high.

Figure 1020-15, Design C, depicts bike lanes along the outer portions of an urban-type curbed street where parking is prohibited. This configuration eliminates potential conflicts with motor vehicle parking. Opening car doors is an example. Minimum widths are shown. Both minimum widths shown must be achieved. With a normal 2 ft gutter, the minimum bike lane width is 5 ft. Post NO PARKING signs when necessary.

Figure 1020-15, Design D, depicts bike lanes on a highway without curbs and gutters. Minimum widths are shown. Additional width is desirable, particularly where motor vehicle operating speeds exceed 40 mph.

High-speed truck, bus, and recreational vehicle traffic can cause problems along a bike lane because of aerodynamic effects and vehicle widths. Increase shoulder width to accommodate the large vehicles and bicycle traffic when 5% or more of the daily traffic is truck, bus, or recreational vehicle traffic.

Bike lanes are not advisable on long, steep downgrades where bicycle speeds greater than 30 mph can be expected. As grades increase, downhill bicycle speeds will increase, which increases the handling problems if riding near the edge of the roadway. In such situations, bicycle speeds can approach those of motor vehicles, and Category A bicyclists will generally move into the motor vehicle lanes to increase sight distance and maneuverability. However, Category B & C bicyclists might be placed in a hazardous position, thus signing in accordance with the MUTCD is needed to alert them of the grade and the need to control their speeds.

Bike lanes are usually placed on the right side of one-way streets. Consider placing the bike lane on the left side only when it produces fewer conflicting movements between bicycles and motor vehicles.

(b) **Intersection and Signal Design**. Most motor vehicle/bicycle collisions occur at intersections. For this reason, design bike lanes at intersections in a manner that will minimize confusion for motorists and bicyclists and will permit both users to operate in accordance with the Rules of the Road. *(RCW 46.61)*

Figure 1020-22 illustrates a typical intersection of multilane streets, with bike lanes on all approaches. Some common movements of motor vehicles and bicycles are shown. At intersections where there are bike lanes and traffic signals, consider the installation of loop detectors within the bike lane (in advance of the intersection). Select loop detectors sensitive enough to detect bicycles. Bicyclists generally prefer not to use push button actuators, as they must go out of the way to actuate the signal. For additional guidance on signal design at intersections involving bike lanes, refer to Chapter 850.

Figures 1020-23a and b illustrate two pavement marking pattern options where bike lanes cross freeway off and on-ramps. Option 1 provides a defined crossing point for bicyclists that want to stay on their original course. This option is desirable when bicyclists for various reasons do not have a good view of traffic. Use Option 2 where bicyclists normally have a good view of traffic entering or exiting the roadway and will adjust their path to cross ramp traffic. A bike crossing sign is intended for use on highways to warn motorists of the possibility of bicyclists crossing the roadway.

Dashed lines across the off-ramp are not permitted.

Figure 1020-24 illustrates the recommended pavement marking patterns where bike lanes cross a channelized right turn only lane. When approaching such intersections, bicyclists will have to merge with right-turning motorists. Since bicyclists are typically traveling at speeds less than motorists, they can signal and merge where there is a sufficient gap in right-turning traffic, rather than at any predetermined location. For this reason, it is most effective to eliminate all delineations at the approach of the right turn lane (or off-ramp) or to extend a single, dashed bike lane line at a flat angle across the right turn lane. A pair of parallel lines (delineating a bike lane crossing) to channelize the bike merge is not recommended as this encourages bicyclists to cross at a predetermined location. In addition, some motorists might assume they have the right of way and neglect to yield to bicyclists continuing straight.

A dashed line across the right-turn-only lane is not recommended where there are double right-turn-only lanes. For these types of intersections, drop all pavement markings to permit judgment by the bicyclists to prevail.

(c) **Traffic Signals**. At signalized intersections, consider bicycle traffic when timing the traffic signal cycle and when selecting the method of detecting the presence of the bicyclist. Contact the region's Bicycle Coordinators for assistance in determining the timing criteria.

(d) **Signing and Pavement Markings**. Use the general guidelines in the MUTCD, Part IX, and the Washington State Modifications to the MUTCD for acceptable signing and pavement marking criteria. Additional guidelines are shown on Figures 1020-15, 1020-25, and 1020-26. Lateral and vertical clearance for signs is shown on Figure 1020-13.

(f) **Drainage Grates and Manhole Covers**. Locate drainage inlet grates and manhole covers to avoid bike lanes. When drainage grates or manhole covers are located on a bike lane, minimize the effect on bicyclists. A minimum of 3 ft of lateral clearance is needed between the edge of a drainage inlet grate and the shoulder stripe. Install and maintain grates and manhole covers level with the surface of the bike lane.

For more information see 1020.05(2)(n).

(4) Design Criteria for Shared Roadway

Any improvements for motor vehicle traffic on a shared roadway will also improve the traveling conditions for bicycles.

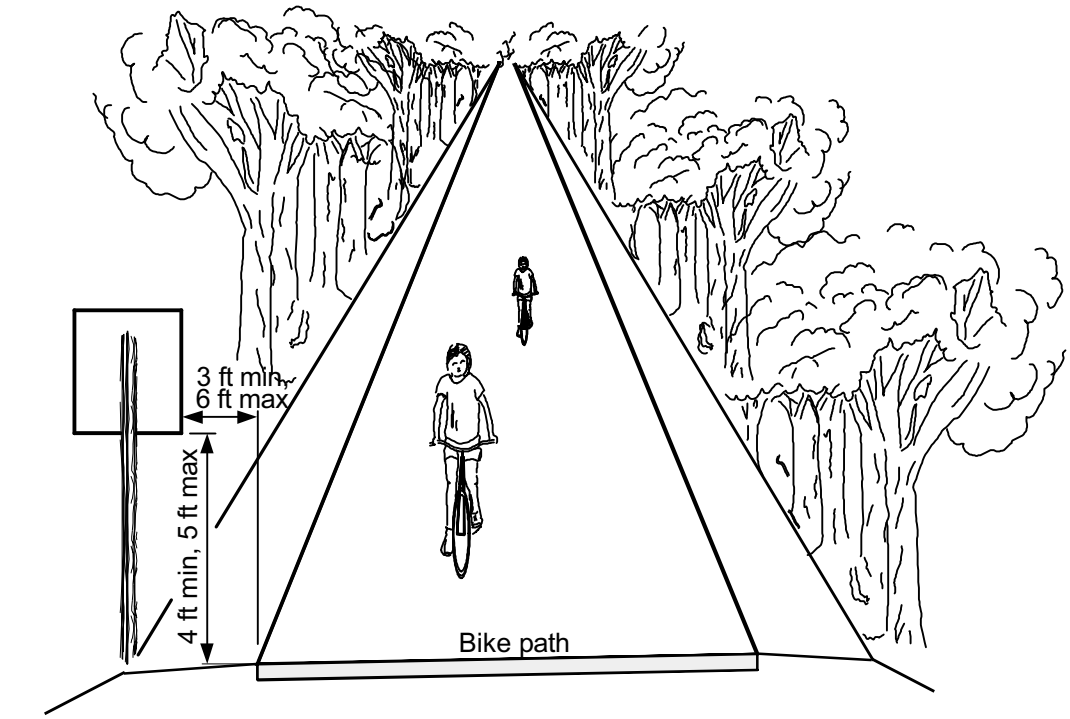
A shared roadway designated as a bike route offers a greater degree of service to bicyclists than other roadways. Establish a bike route by placing the MUTCD Bicycle Route signs or markers along the roadway. Improvements might have to be made for safer bicycle travel. Some improvements for facilitating better bicycle travel are widening the shoulders using the shoulder criteria in Chapter 430 "Modified Design Level" and 440 "Full Design Level", adding pavement markings, improving roadside maintenance, removing surface hazards such as drain grates not compatible with bicycle tires, and other facilities to provide better traveling for bicyclists.

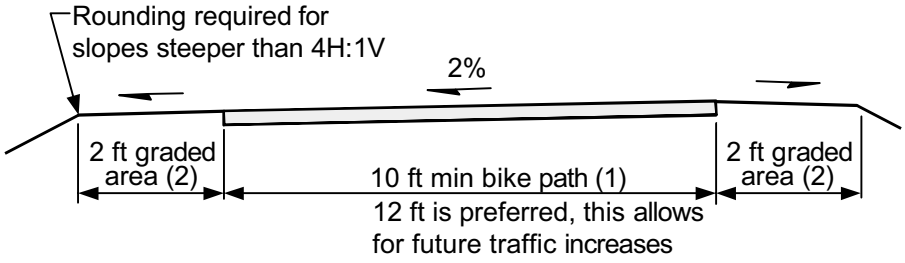
1020.06 Documentation

The following documents are to be preserved in the project file. See Chapter 330.

- ☐ Justification for reduction of roadway cross sections
- ☐ Justification for reduction of bikeway cross sections
- ☐ New or major improvement projects where bike lanes or bike paths are not accommodated (except where prohibited).

P65:DP/DM



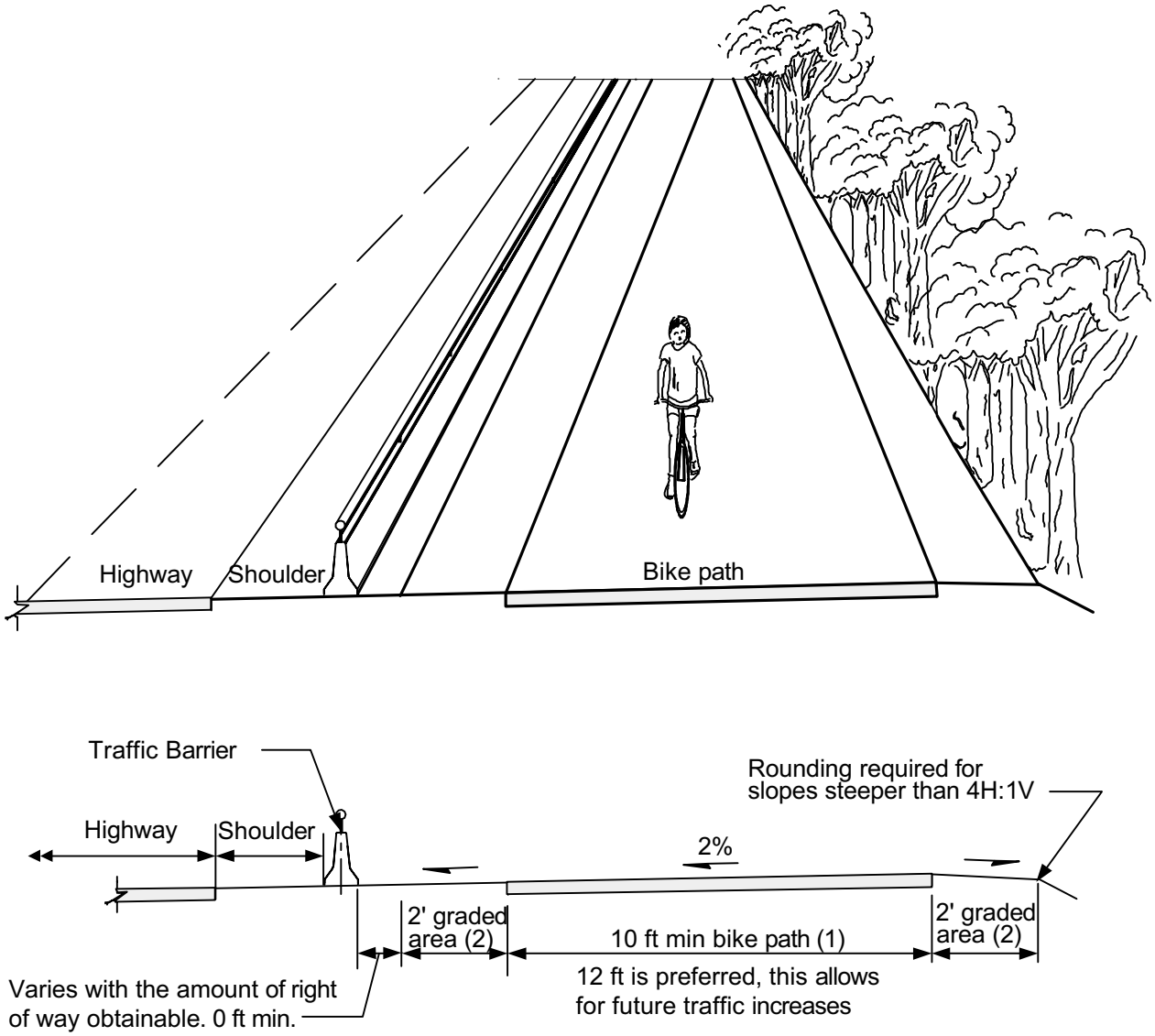


NOTE:

(1) Use 12 to 14 ft when maintenance vehicles use a shared use path as an access road for utilities. Use of 12 to 14 ft paths is recommended when there will be substantial use by bicycles ($\geq$60 bicycles per day), or joggers, skaters, and pedestrians (20 per hour). Contact region's Bicycle Coordinator for bicycle use information. See 1020.05(2)(a) for more discussion on bicycle path widths.

(2) Where the paved width is wider than the minimum required, reduce the graded area accordingly.

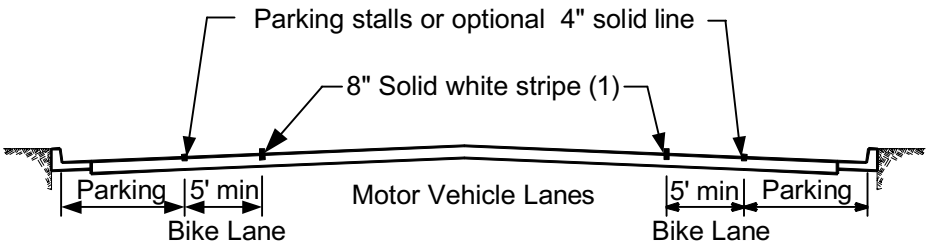
Two-Way Shared Use Path on Separate Right of Way
Figure 1020-13



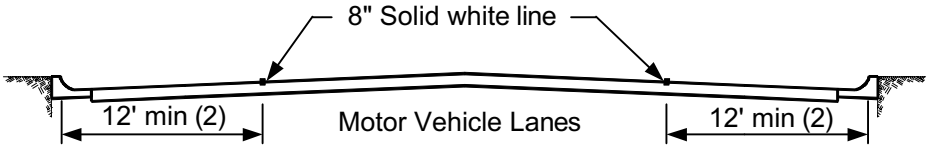
For Notes (1) and (2) see Figure 1020-13

See 1020.05(2)(e) for selecting barriers between bicycle path and shoulder and the need for fencing on limited access roadways.

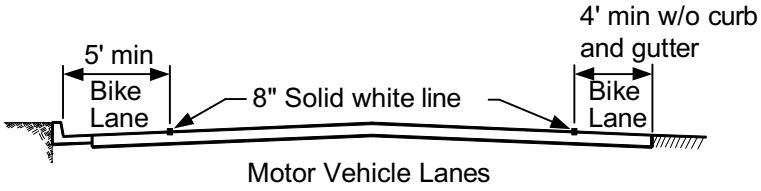
Two-Way Shared Use Path Adjacent to Roadway
Figure 1020-14



Design A marked parking

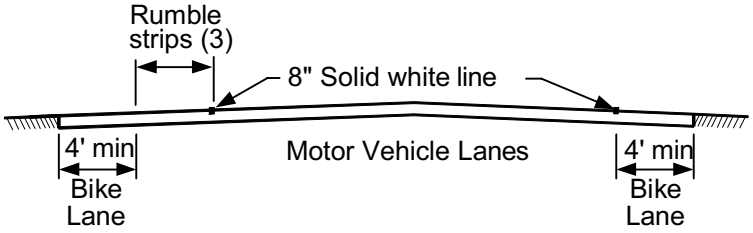


Design B parking permitted without parking line or stall



Design C parking prohibited

Post NO PARKING signs as required



Design D typical roadway

Note:

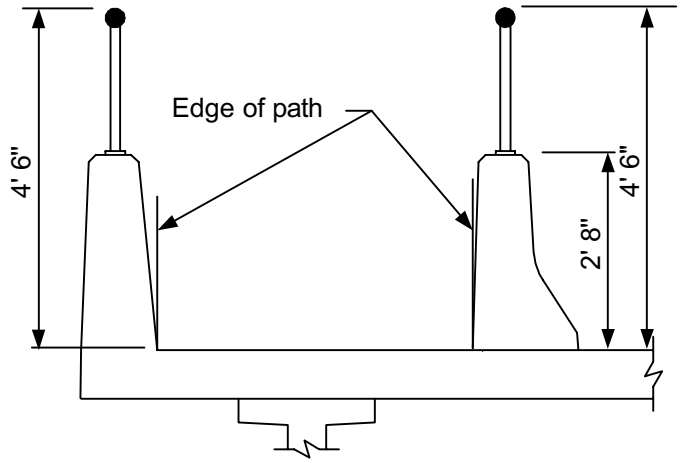
(1) The optional solid white line might be advisable where stalls are unnecessary (because parking is light) but there is concern that motorists might misconstrue the bike lane to be a traffic lane.

(2) 13 ft – 14 ft is recommended where there is substantial parking or turnover of parked cars is high.

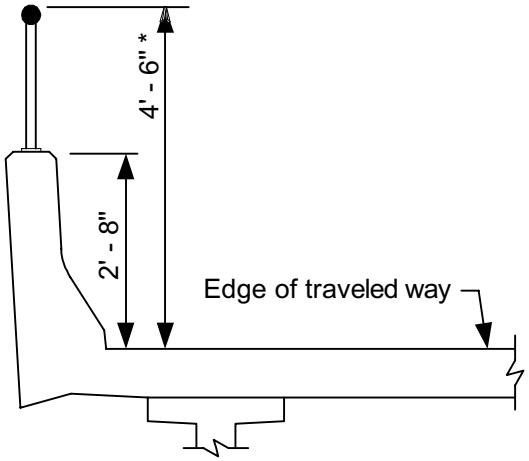
(3) If rumble strips exist, provide 4 ft minimum from the rumble strips to the outside edge of the shoulder.

Typical Bike Lane Cross Sections

Figure 1020-15



Separated (shared use paths only)



Unseparated (bike lanes and shared roadway)

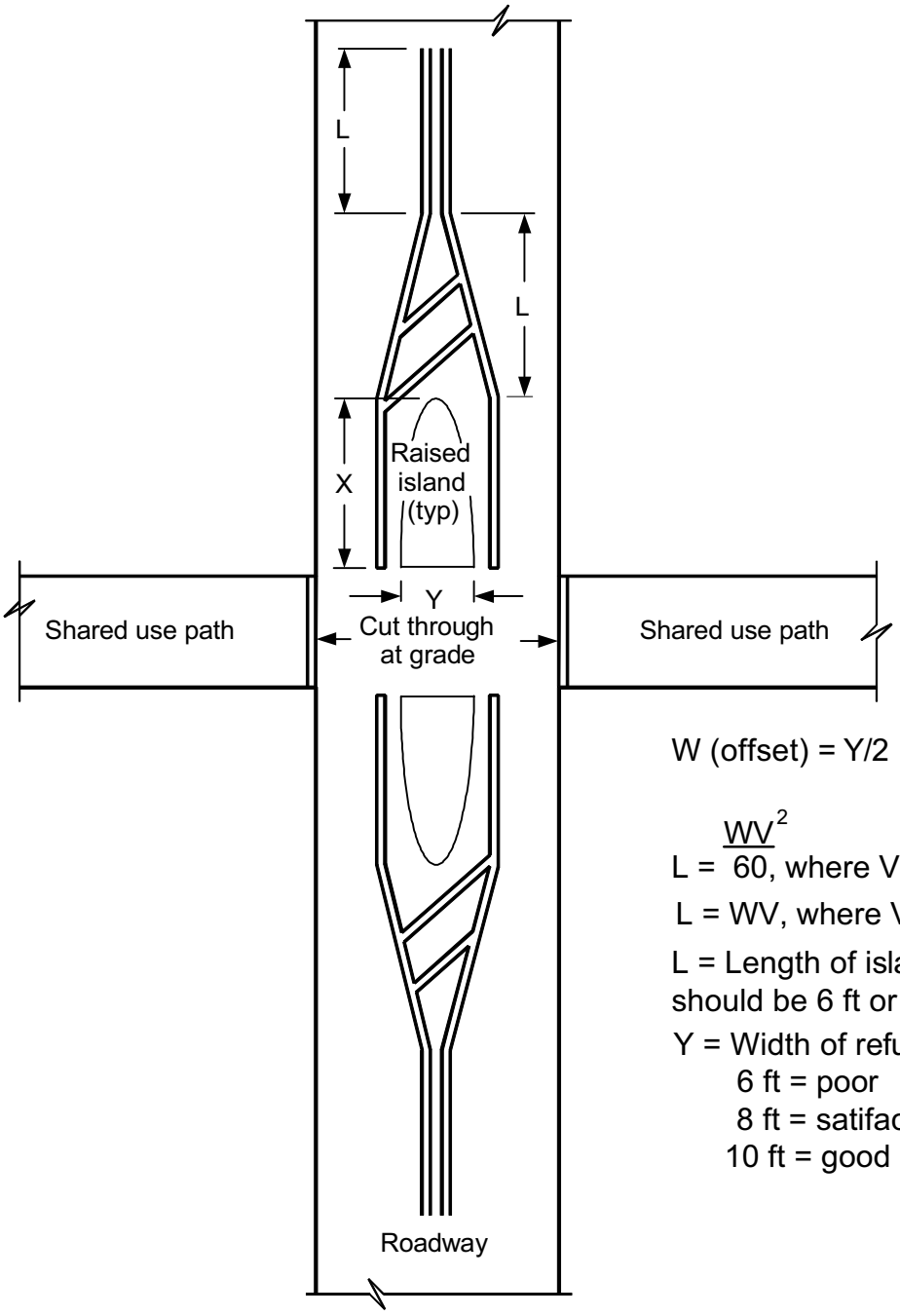
Bicyclists use the shoulder between the edge of traveled way and the bridge rail.

Note:

The above applies to bike lanes and shared use paths. The 2'-8" barrier is used for shared use roadways.

Bikeways on Highway Bridges

Figure 1020-16



W (offset) = Y/2

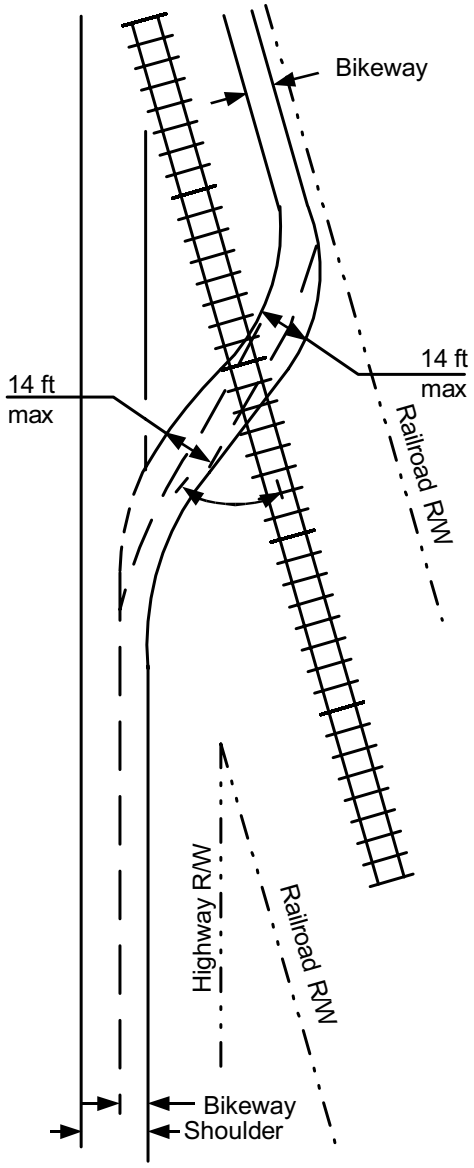
$$L = \frac{WV^2}{60}, \text{ where } V < 45 \text{ mph}$$

$L = WV$, where $V \geq 45$ mph

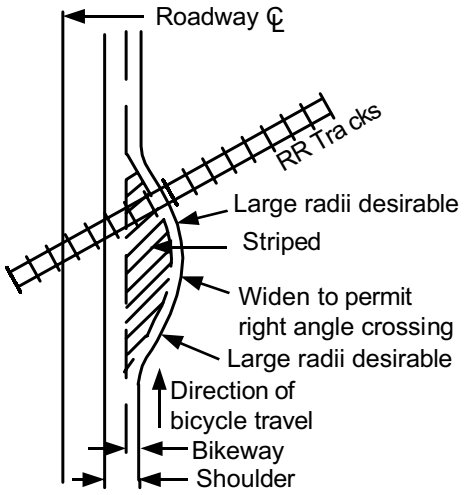
L = Length of island
should be 6 ft or greater

Y = Width of refuge
6 ft = poor
8 ft = satifactory
10 ft = good

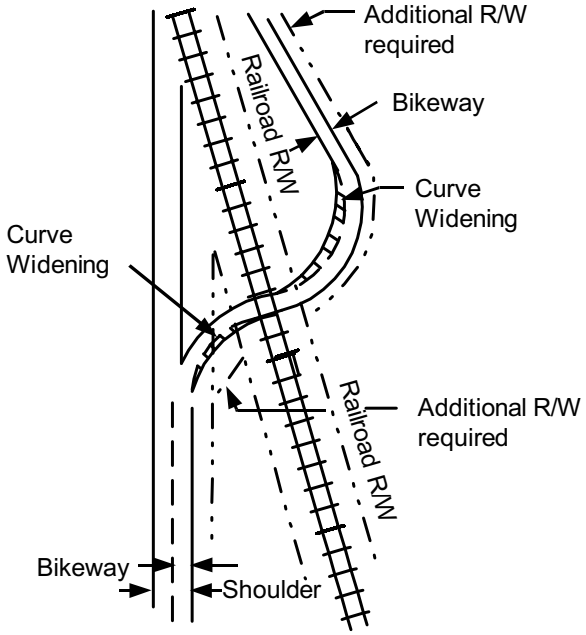
Refuge Area
Figure 1020-17



45º Crossing
(acceptable)



Widened Shoulder

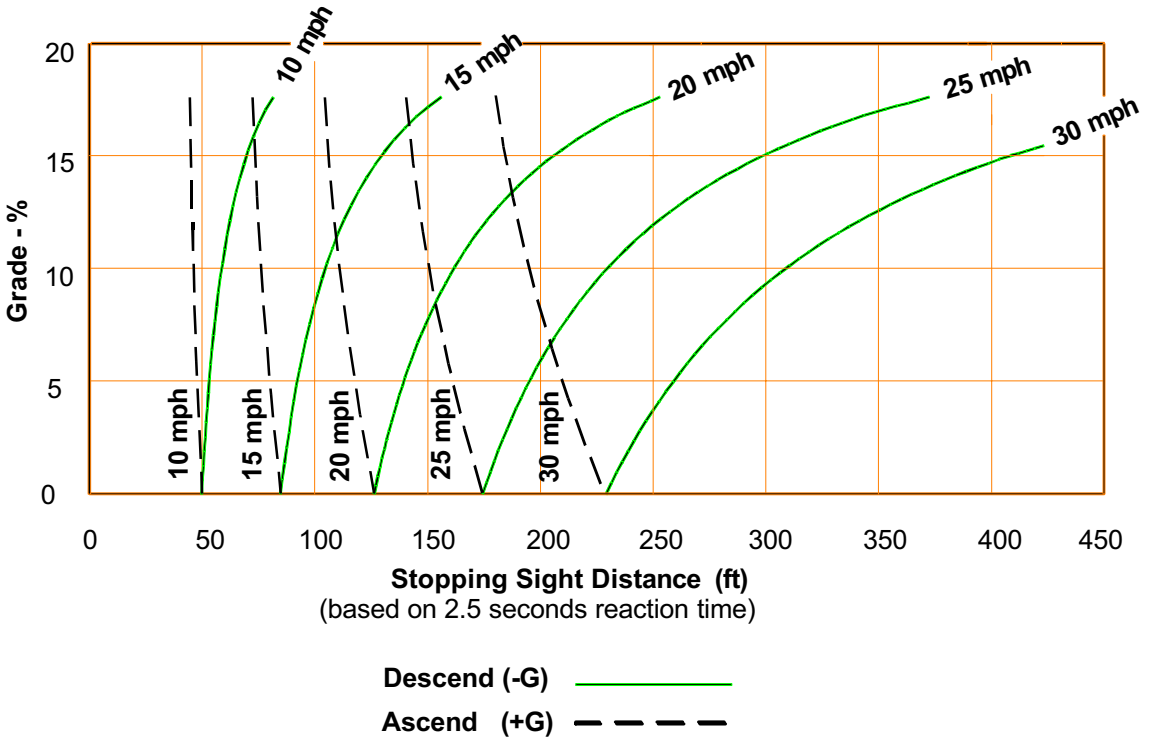


90º Crossing
(most desirable)

Note:

Provide additional width to 14 ft to be provided at railroad crossing to allow bicyclists to choose their own crossing routes.

At-Grade Railroad Crossings
Figure 1020-18



$$S = \frac{V^2}{30\,(f \pm G)} + 3.67\,V$$

Where:

S = Stopping Sight Distance, ft.
V = Velocity, mph
f = Coefficient of Friction (use 0.25)
G = Grade ft/ft (rise/run)

Stopping Sight Distance
Figure 1020-19

A	Stopping Sight Distance, S (ft)													
(%)	40	60	80	100	120	140	160	180	200	220	240	260	280	300
2	3	3	3	3	3	3	3	3	3	3	30	70	110	150
3	3	3	3	3	3	3	20	60	100	140	180	220	260	300
4	3	3	3	3	15	55	95	135	175	215	256	300	348	400
5	3	3	3	20	60	100	140	180	222	269	320	376	436	500
6	3	3	10	50	90	130	171	216	267	323	384	451	523	600
7	3	3	31	71	111	152	199	252	311	376	448	526	610	700
8	3	8	48	88	128	174	228	288	356	430	512	601	697	800
9	3	20	60	100	144	196	256	324	400	484	576	676	784	900
10	3	30	70	111	160	218	284	360	444	538	640	751	871	1000
11	3	38	78	122	176	240	313	396	489	592	704	826	958	1100
12	5	45	85	133	192	261	341	432	533	645	768	901	1045	1200
13	11	51	92	144	208	283	370	468	578	699	832	976	1132	1300
14	16	56	100	156	224	305	398	504	622	753	896	1052	1220	1400
15	20	60	107	167	240	327	427	540	667	807	960	1127	1307	1500
16	24	64	114	178	256	348	455	576	711	860	1024	1202	1394	1600
17	27	68	121	189	272	370	484	612	756	914	1088	1277	1481	1700
18	30	72	128	200	288	392	512	648	800	968	1152	1352	1568	1800
19	33	76	135	211	304	414	540	684	844	1022	1216	1427	1655	1900
20	35	80	142	222	320	436	569	720	889	1076	1280	1502	1742	2000
21	37	84	149	233	336	457	597	756	933	1129	1344	1577	1829	2100
22	39	88	156	244	352	479	626	792	978	1183	1408	1652	1916	2200
23	41	92	164	256	368	501	654	828	1022	1237	1472	1728	2004	2300
24	43	96	171	267	384	523	683	864	1067	1291	1536	1803	2091	2400
25	44	100	178	278	400	544	711	900	1111	1344	1600	1878	2178	2500
Minimum Length of Vertical Curve, L (ft)														

$$L = \frac{AS^2}{900} \quad \text{when } S < L$$

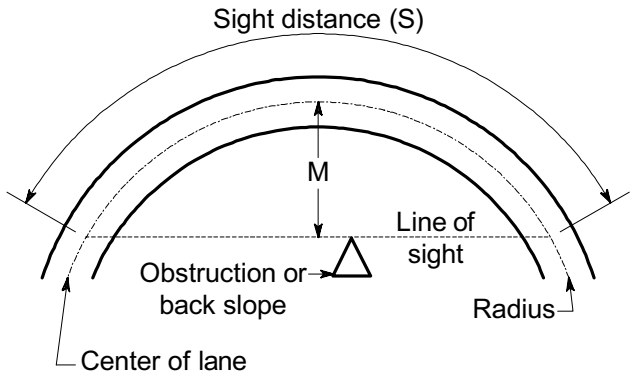
$$L = 2S - \frac{900}{A} \quad \text{when } S > L$$

Where:
S = Stopping sight distance.
A = Algebraic difference in grade.
L = Minimum vertical curve length

Based on an eye height of 4.5 ft and an object height of 0 ft.

Sight Distances for Crest Vertical Curves
Figure 1020-20

Height of eye: 4.50 ft
Height of object: 0.0 ft
Line of sight is normally 2.25 ft above center line of inside lane at point of obstruction provided no vertical curve is present in horizontal curve.



$$M = R\left(1 - COS\frac{28.65\ S}{R}\right)$$

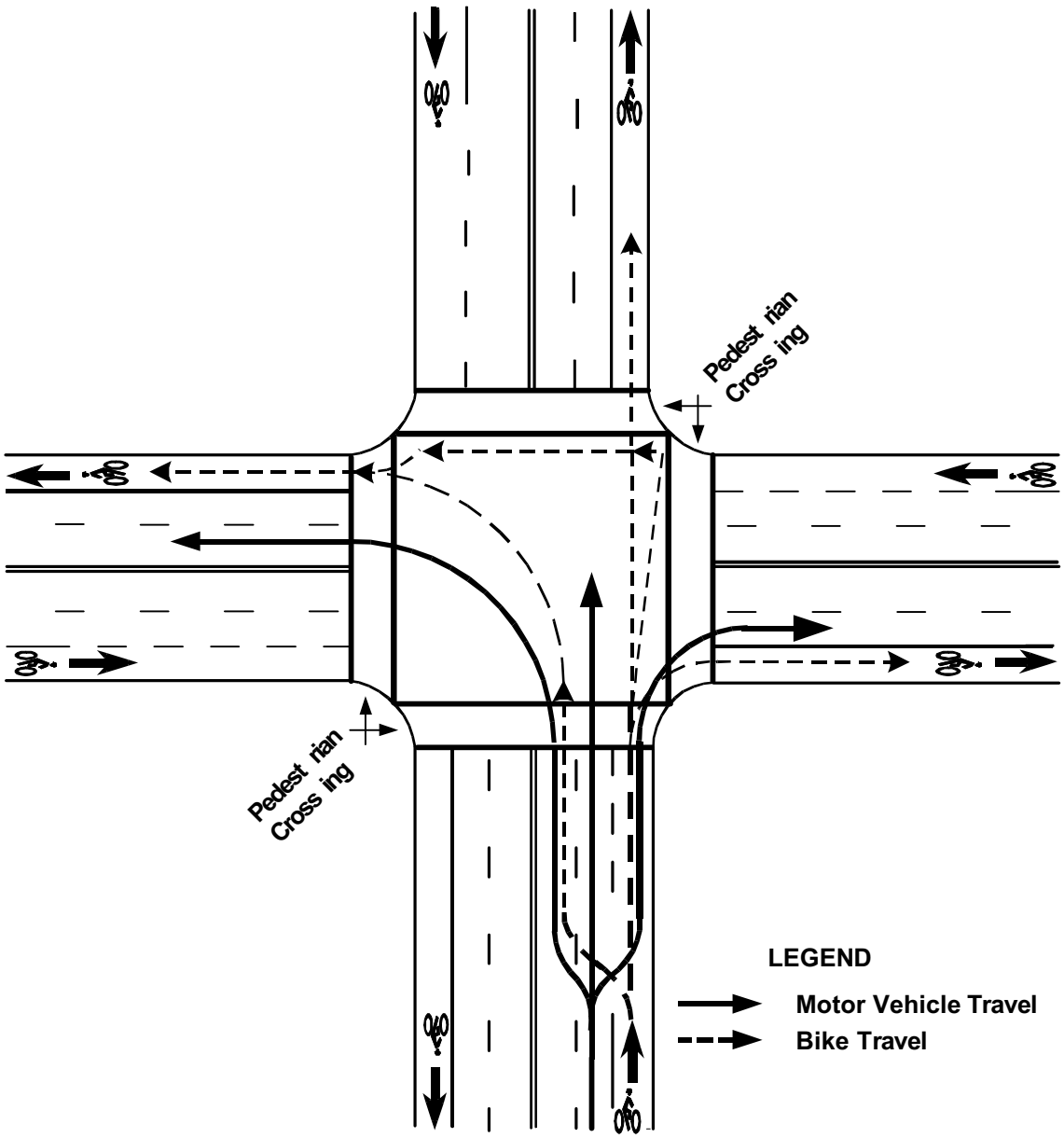
$$S = \frac{R}{28.65}\left[COS^{-1}\left(\frac{R-M}{R}\right)\right]$$

Where:
S = Sight distance in feet
R = Radius of center line inside lane in feet
M = Distance from center line inside lane in feet

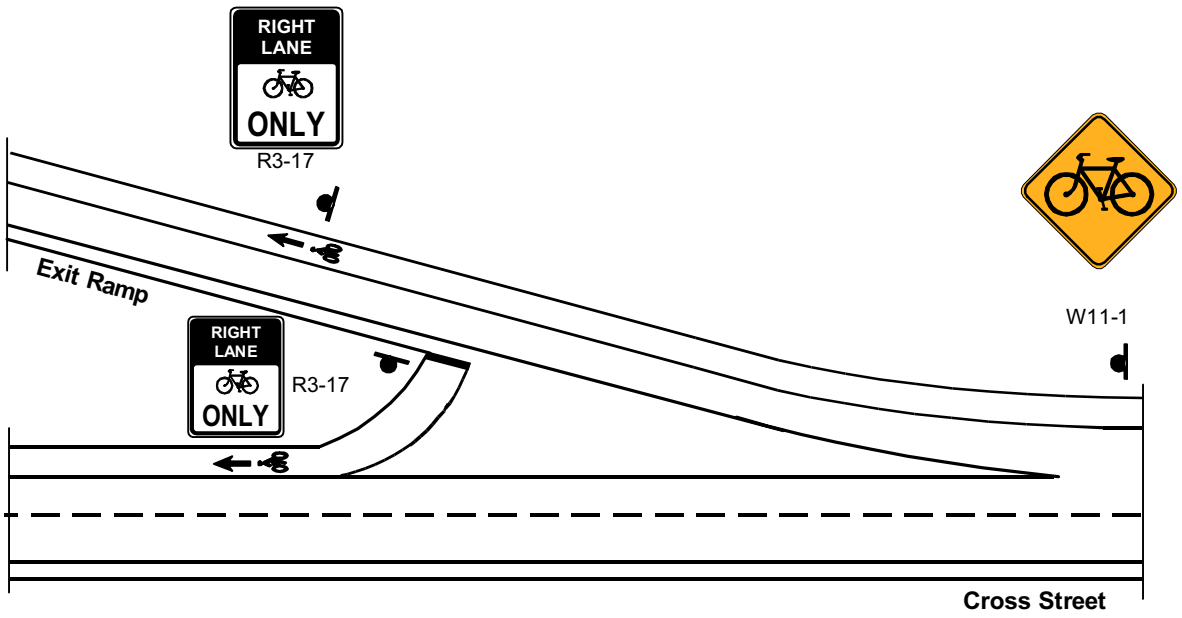
$S \leq$ Length of curve
Angle is expressed in degrees

R (ft)	Stopping Sight Distance, S (ft)													
	40	60	80	100	120	140	160	180	200	220	240	260	280	300
25	7.6	15.9												
50	3.9	8.7	15.2	23.0	31.9	41.5								
75	2.7	5.9	10.4	16.1	22.7	30.4	38.8	47.8	57.4	67.2				
95	2.1	4.7	8.3	12.9	18.3	24.6	31.7	39.5	47.9	56.9	66.2	75.9	85.8	
125	1.6	3.6	6.3	9.9	14.1	19.1	24.7	31.0	37.9	45.4	53.3	61.7	70.5	79.7
150	1.3	3.0	5.3	8.3	11.8	16.0	20.8	26.2	32.1	38.6	45.5	52.9	60.7	69.0
175	1.1	2.6	4.6	7.1	10.2	13.8	18.0	22.6	27.8	33.4	39.6	46.1	53.1	60.4
200	1.0	2.2	4.0	6.2	8.9	12.1	15.8	19.9	24.5	29.5	34.9	40.8	47.0	53.7
225	0.9	2.0	3.5	5.5	8.0	10.8	14.1	17.8	21.9	26.4	31.2	36.5	42.2	48.2
250	0.8	1.8	3.2	5.0	7.2	9.7	12.7	16.0	19.7	23.8	28.3	33.0	38.2	43.7
275	0.7	1.6	2.9	4.5	6.5	8.9	11.6	14.6	18.0	21.7	25.8	30.2	34.9	39.9
300	0.7	1.5	2.7	4.2	6.0	8.1	10.6	13.4	16.5	19.9	23.7	27.7	32.1	36.7
350	0.6	1.3	2.3	3.6	5.1	7.0	9.1	11.5	14.2	17.1	20.4	23.9	27.6	31.7
400	0.5	1.1	2.0	3.1	4.5	6.1	8.0	10.1	12.4	15.0	17.9	20.9	24.3	27.8
500	0.4	0.9	1.6	2.5	3.6	4.9	6.4	8.1	10.0	12.1	14.3	16.8	19.5	22.3
600	0.3	0.7	1.3	2.1	3.0	4.1	5.3	6.7	8.3	10.1	12.0	14.0	16.3	18.7
700	0.3	0.6	1.1	1.8	2.6	3.5	4.6	5.8	7.1	8.6	10.3	12.0	14.0	16.0
800	0.2	0.6	1.0	1.6	2.2	3.1	4.0	5.1	6.2	7.6	9.0	10.5	12.2	14.0
900	0.2	0.5	0.9	1.4	2.0	2.7	3.6	4.5	5.5	6.7	8.0	9.4	10.9	12.5
1000	0.2	0.4	0.8	1.2	1.8	2.4	3.2	4.0	5.0	6.0	7.2	8.4	9.8	11.2
Minimum Lateral Clearance, M (ft)														

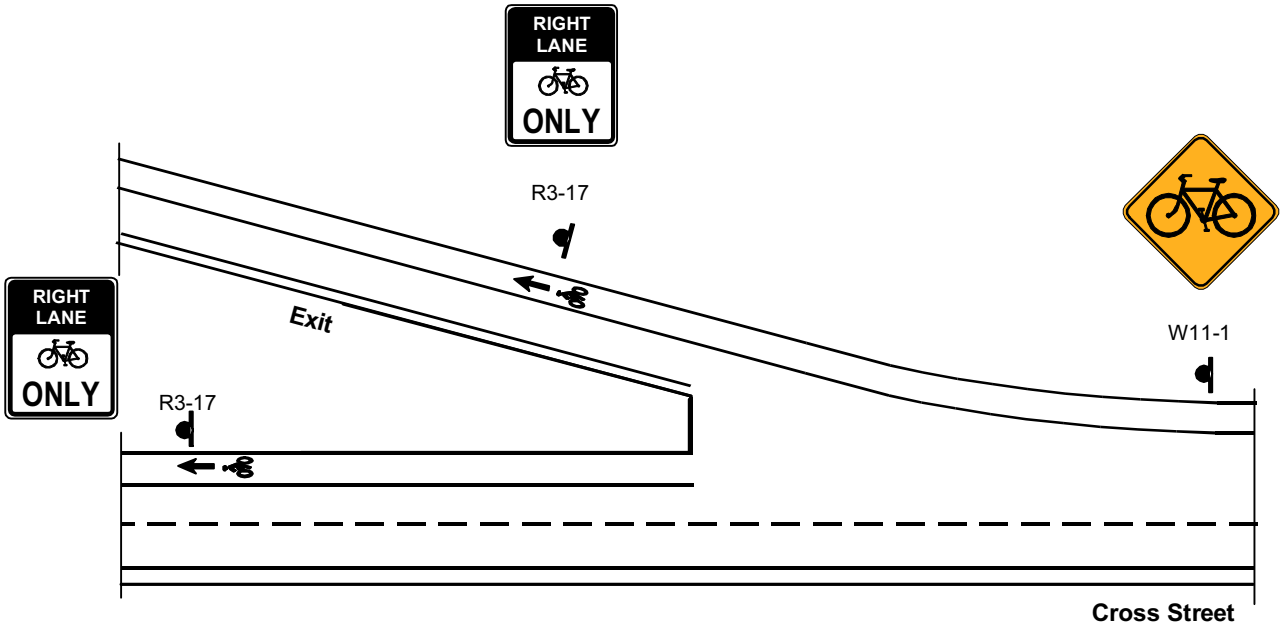
Lateral Clearance on Horizontal Curves
Figure 1020-21



Typical Bicycle/Auto Movements at Intersection of Multilane Streets
Figure 1020-22



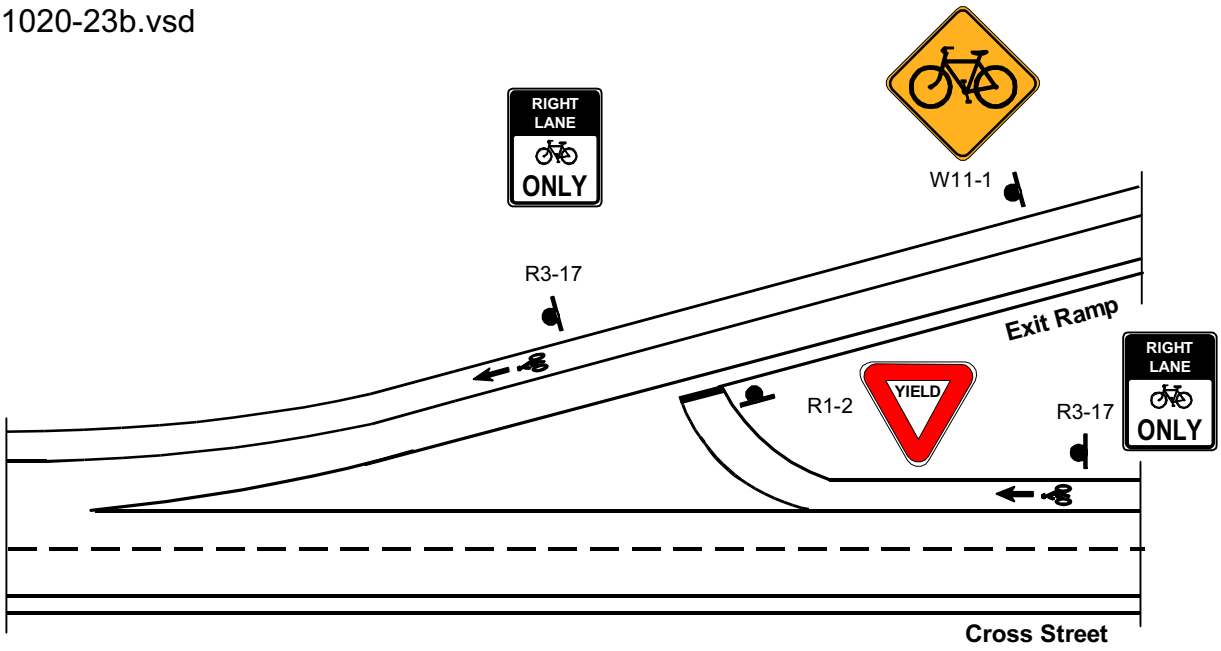
Option 1



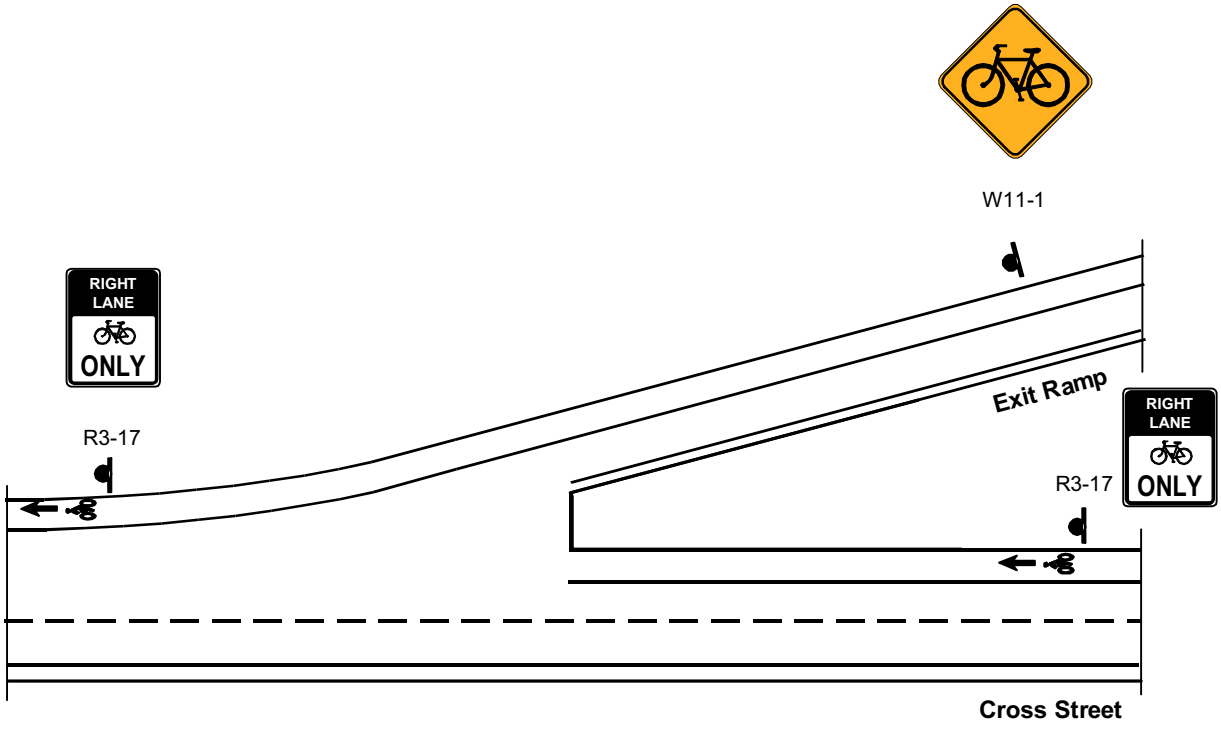
Option 2

Bicycle Crossing of Interchange Ramp
Figure 1020-23a

1020-23b.vsd

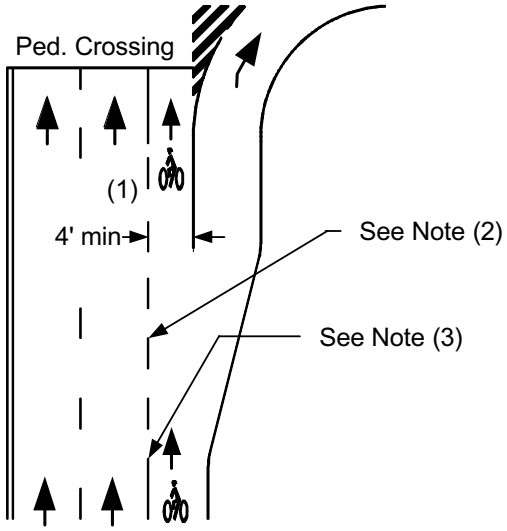


Option 1

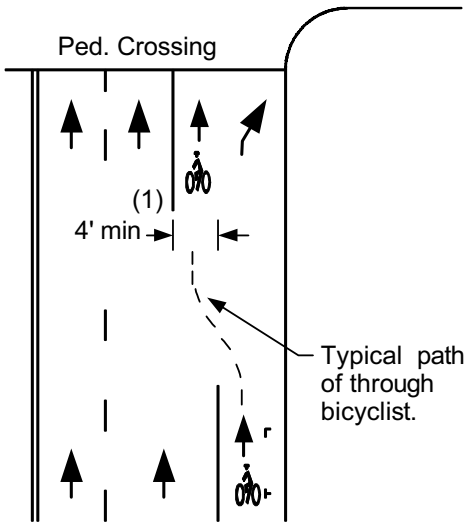


Option 2

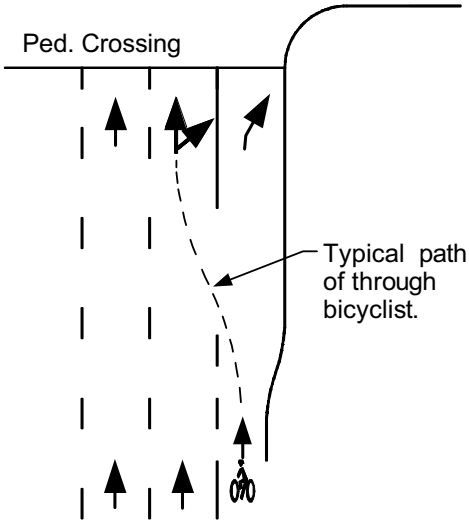
Bicycle Crossing of Interchange Ramp
Figure 1020-23b



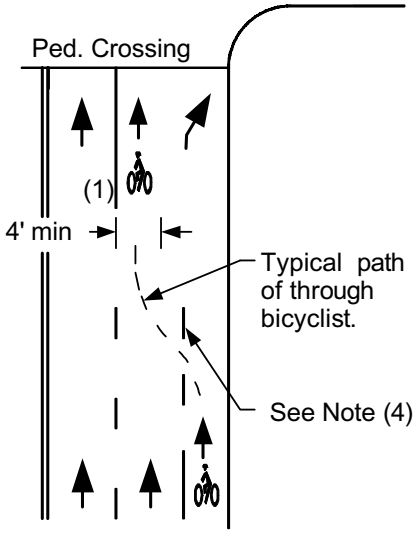
RIGHT-TURN-ONLY LANE



PARKING AREA BECOMES
RIGHT-TURN-ONLY LANE



OPTIONAL DOUBLE
RIGHT-TURN-ONLY LANE



RIGHT LANE BECOMES
RIGHT-TURN-ONLY LANE

Note:

(1) If space is available.

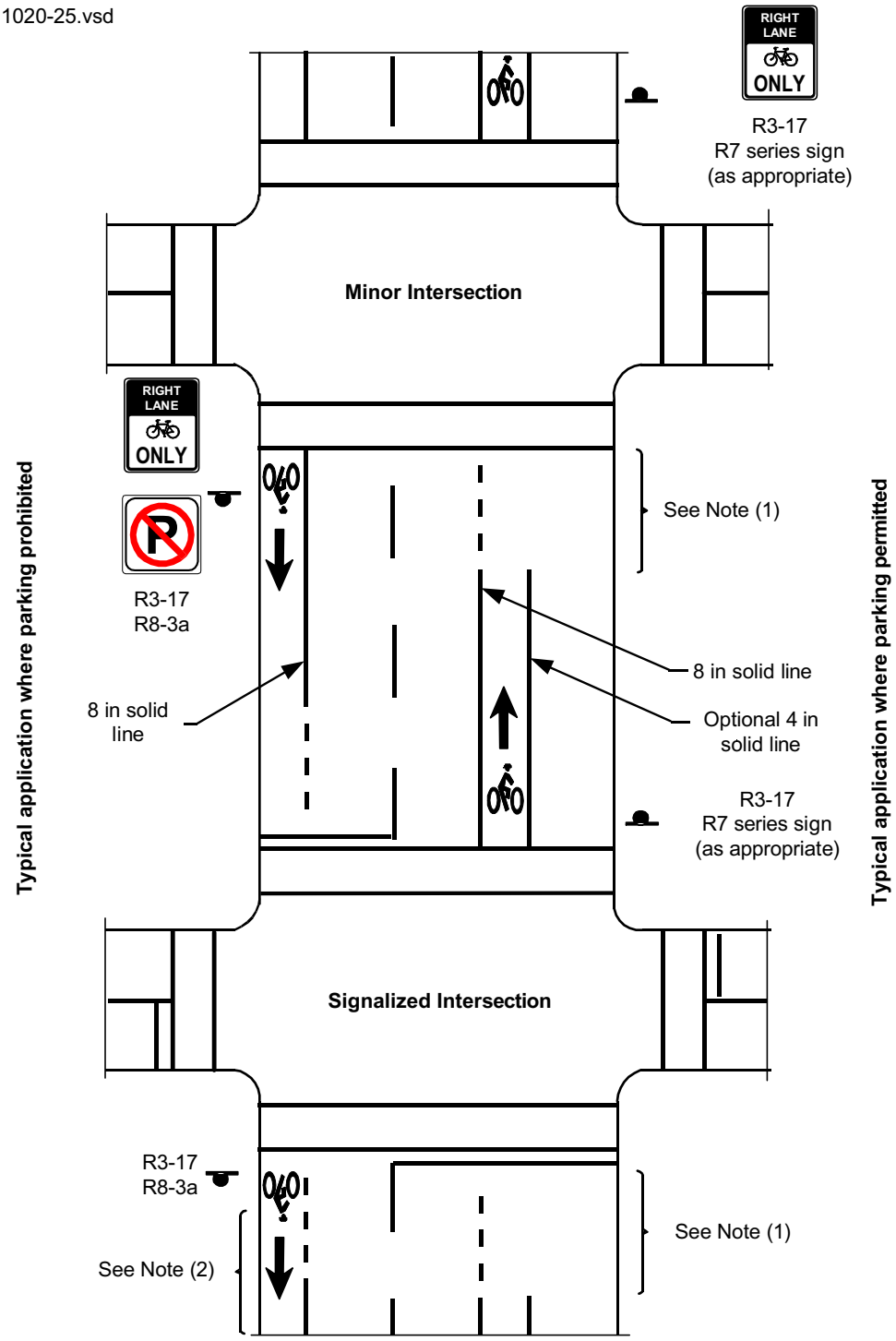
(2) Optional dashed line. Not recommended where a long right-turn-only lane or double turn lanes exist.

(3) Otherwise, drop all delineation at this point.

(4) Drop bike lane line where right-turn-only designated.

Bike Lanes Approaching Motorists' Right-Turn-Only Lanes

Figure 1020-24

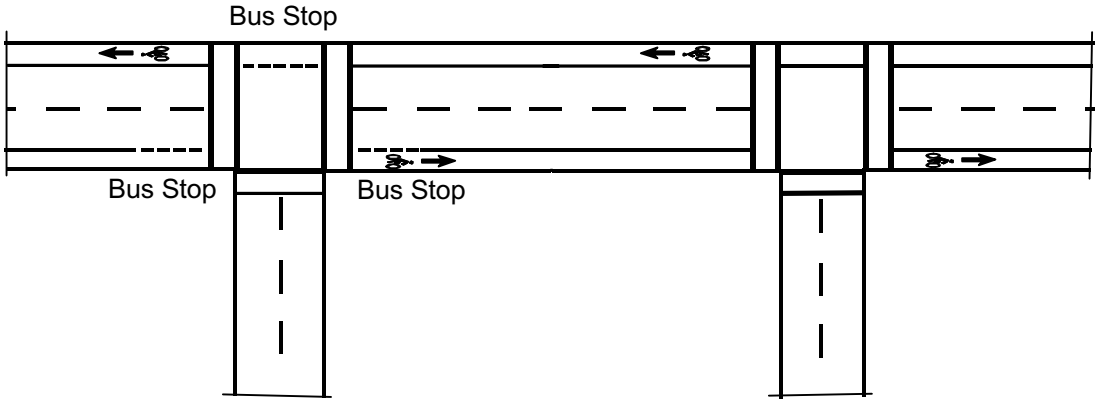


Note:

(1) 50 to 200 ft dotted line if bus stop or heavy right-turn volume, otherwise solid line.

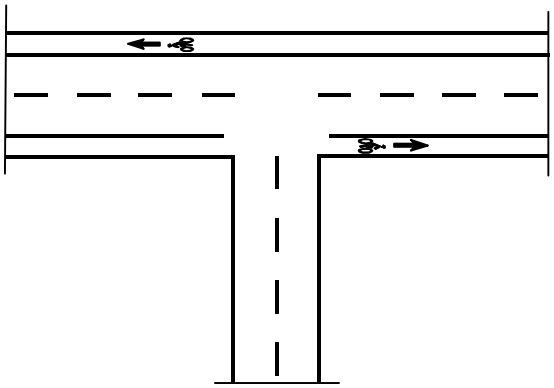
(2) Dotted line for bus stops immediately beyond the intersection is optional; otherwise use 8 in solid line

Typical Pavement Marking for Bike Lane on Two-Way Street
Figure 1020-25



T-Intersection
with bus stops
and painted crosswalks

T-Intersection
with painted crosswalks
and no bus stops



T-Intersection
with no painted crosswalks

Typical Bike Lane Pavement Markings at T-Intersections
Figure 1020-26